

BRITISH MITES OF THE  
SUBFAMILY *MACROCHELINAE* TRÄGÅRDH  
(*GAMASINA—MACROCHELIDAE*)



BY  
G. OWEN EVANS  
AND  
E. BROWNING

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# BRITISH MITES OF THE SUBFAMILY MACROCHELINAE TRÄGÅRDH (GAMASINA—MACROCHELIDAE)

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## SYNOPSIS

The classification of the Macrochelidae is discussed, with particular reference to the British species, and three new species are described and figured.

## INTRODUCTION

THE recent lists of the genera of the *Macrochelidae* follow the classification proposed by Berlese (1918), the only comprehensive work on the family. Vitzthum (1941) recognizes eight genera and eleven subgenera to which must be added the genera *Neoholaspis* Turk, 1948 (? syn: *Macrocheles* Latr. s. str.) and *Andrholaspis* Turk, 1948, and the subgenera *Cyrtocheles* Valle, 1953 and *Longicheles* Valle, 1953 of *Geholaspis* Berl. s. lat.

The British *Macrochelidae* have been investigated by Hull (1918 and 1925), Falconer (1923 and 1924) and Turk (1946). In 1918, Hull keyed ten species of *Macrocheles*, of which four were considered to be new. Later, in 1925, he described ten more new species and proposed a new name (*Macrocheles* (*Monoplites*) *oudemansii*) for *Macrocheles marginalis* Oudemans, 1901 nec Hermann, 1804. He used the chaetotaxy of the dorsal shield and the form of the ventral shields as his chief taxonomic criteria and although these characters have been proved subsequently to be useful key characters, his descriptions and figures are so inadequate (and often inaccurate) that a number of the species cannot be recognised with certainty.

Falconer's contribution to the study of the family consists of descriptions and figures of two new species and the erection of a new subgenus (*Dissoloncha*) of *Macrocheles*.

Turk (1946) has described one new species, *Coprholaspis anglicus*, from under wet wood at Reskadinnick, Cornwall, and has keyed British species of the genus *Coprholaspis* Berl.

The object of the present work is to redescribe and figure the known British species of the *Macrochelinae*. We have followed Sellnick's interpretation of the species of C. L. Koch and Scopoli (Sellnick, 1931 and 1940).

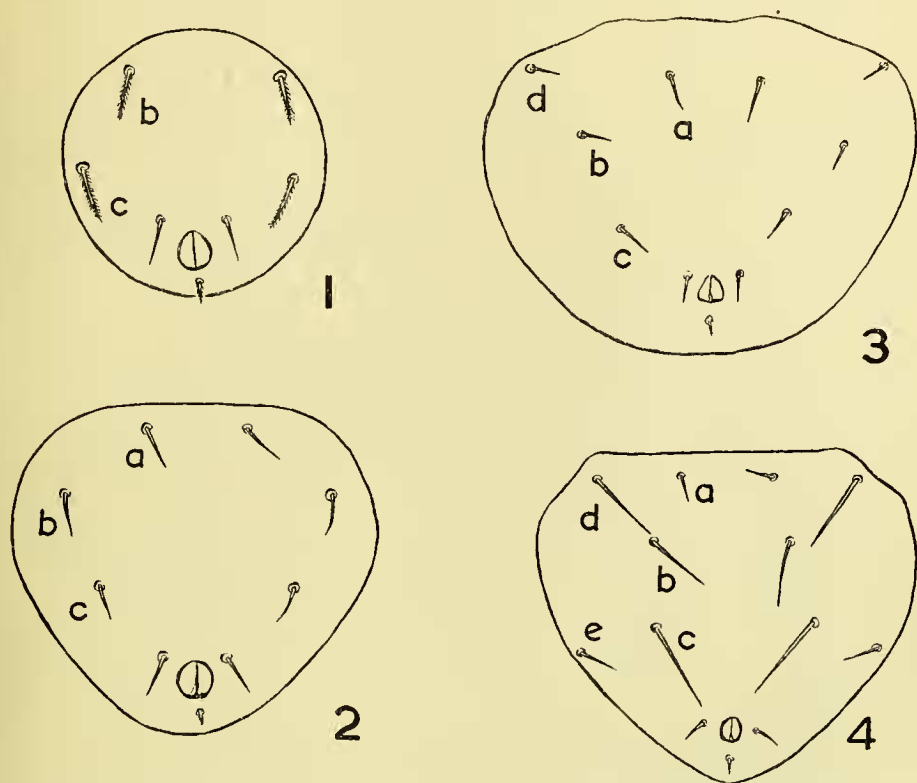
## EXTERNAL MORPHOLOGY

The following account of the external morphology of the British species of the *Macrochelinae* refers to the adult stages only and will serve as a general introduction to the characters of taxonomic importance used in the keys to species.

*Dorsal shield*: The dorsal shield in all British species is entire and covers practically the whole of the dorsum of the mite. The ornamentation of the shield shows considerable variety in form, for example, the shield may be faintly reticulated as in *Macrocheles glaber* (Müller), strongly reticulated and punctate as in *Macrocheles tardus* (C. L. Koch) or densely covered with minute tubercles as in *Geholaspis* (*Longicheles*) *mandibularis* (Berl.). Its lateral margin may be smooth or serrated.

The number of setae on the shield is remarkably constant, twenty-eight pairs in the female, except in three species (*Macrocheles montana* (Willm.), *Macrholaspis opacus* (C. L. Koch) and *Macrholaspis dentatus* sp.n.). The chaetotactic pattern and structure of the setae (whether simple, serrated or plumose) afford valuable taxonomic criteria. Sellnick (1942) and Valle (1955) have already used the chaetotaxy of the shield in their works on *Macrocheles* and *Geholaspis* s. lat., respectively. The nomenclature used for the dorsal chaetotaxy in the present work is given in Text-fig. 5. The twenty-

eight pairs of setae of the female are divided into four longitudinal rows; a dorsal series (D) of eight pairs, a median series (M) of four pairs, a lateral series (L) of six pairs and a marginal series (Mg) of ten pairs. This division is purely artificial and is not based on the post-embryonic developmental sequence. In the males, two groups



FIGS. 1-4. The chaetotaxy of the ventri-anal shield in females of *Macrholaspis* Oudemans (Fig. 1), *Macrocheles* Latr. (Fig. 2), *Holostaspella* Berl. (Fig. 3), and *Geholaspis* Berl. (Fig. 4), *a*, anterior pre-anal seta; *b*, median pre-anal seta; *c*, posterior pre-anal seta; *d*, antero-lateral pre-anal seta; *e*, postero-lateral pre-anal seta.

can be recognized, namely, those which have the same chaetotactic pattern as the female and those which have a greater number of setae on the shield. In the latter, setae are added to the shield through its extension laterally to incorporate a number of the setae (the extra-marginal setae) normally situated on the lateral interscutal membrane.

The anterior margin of the shield in the genera *Macrocheles*, *Macrholaspis* and *Geholaspis* is gently rounded with the vertical setae (D<sub>1</sub>) situated medially at a short

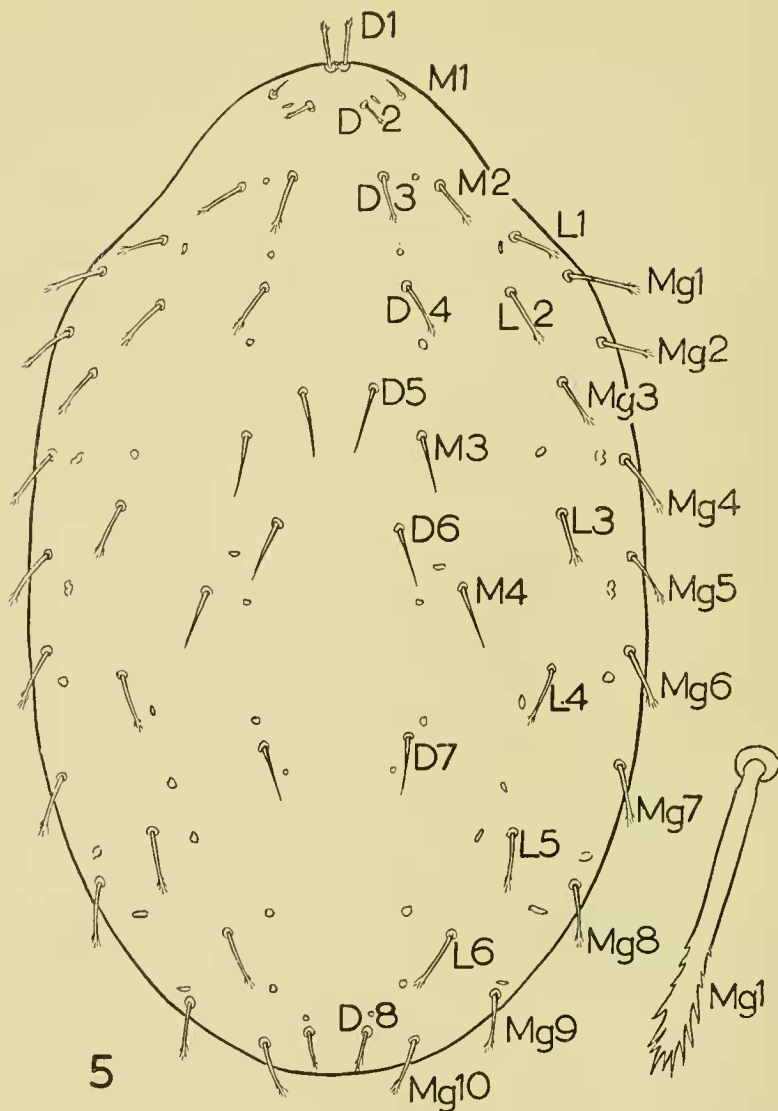


FIG. 5. Chaetotaxy of the dorsal shield in *Macrocheles muscaedomesticae* (Scopoli), female. D1-D8, dorsal series; M1-M4, median series; L1-L6, lateral series; Mg1-Mg10, marginal series.

distance from the margin. In *Holostaspella*, however, the vertical setae are no longer on the summit of the shield but on an outgrowth from it (Text-fig. 82).

In addition to the setae, the shield is provided with a number of pore-like structures. There are normally twenty-two pairs of these "pores".

*Tritosternum*. This structure is well-developed throughout the group and consists of a rectangular base, longer than wide, and a pair of long, pilose lacinae.

*Ventral shields*. In the female, the ventral shields comprise the sternal, metasternal, genital, ventri-anal and metapodals.

The sternal shield is strongly sclerotized and carries three pairs of setae ( $h_1$ ,  $h_2$  and  $h_3$ ) and two pairs of pores. The ornamentation of the shield is usually characteristic of a species or a group of species. Berlese (1918) used the ornamentation of the shield as a major character for subdividing the subgenus *Coprholaspis* and introduced a system of nomenclature for the lines and punctate areas forming the basic pattern (Text-fig. 2). The writers have referred, in the main, to a photograph of the sternal shield instead of attempting a description of the ornamentation. The metasternal shields are paired and free, i.e. they are not fused with the sternal or endopodal shields. Each bears a seta and usually a "pore".

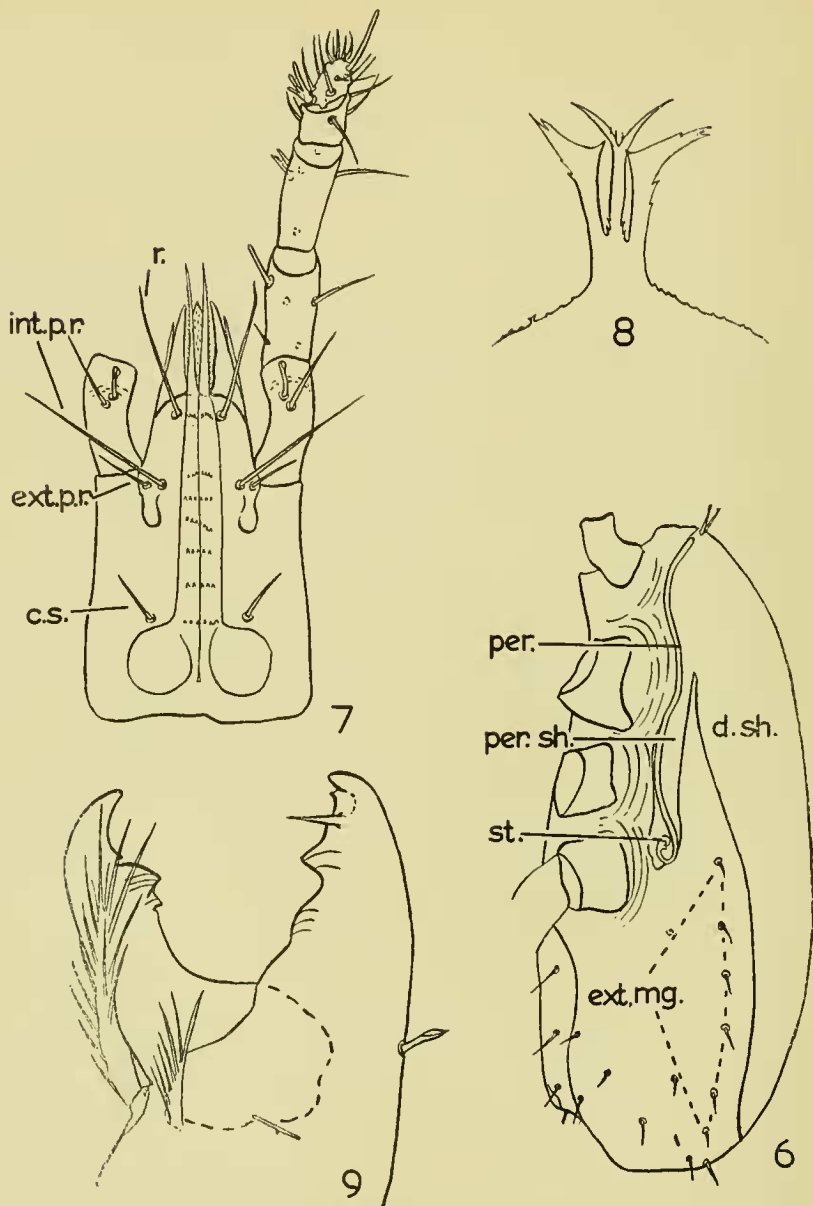
The genital shield lies between coxae IV and carries a pair of genital setae. It is invariably reticulated and punctured, and is provided with accessory sclerites as in the genus *Veigaia* Oudms. (*Gamasina-Veigaiaidae*). The lateral sclerites are usually well-developed, but the median sclerite is often only weakly sclerotized.

The region posterior to coxae IV is largely occupied by a ventri-anal shield bearing two (*Macrholaspis*), three (*Macrocheles*), four (*Holostaspella*) or five pairs (*Geholaspis*) of pre-anal setae. The nomenclature for these setae is given in Text-figs. 3–6. In addition to the pre-anals the shield bears the normal three setae associated with the anus, namely, the paired para-anals and the post-anal seta. The surface of the shield is usually reticulated and punctured. The interscutal membrane between the genital and ventri-anal shields may be provided with sclerotised platelets. The metapodal shields are relatively small and inconspicuous.

In the male, the ventral surface may be covered by a sterniti-genital shield in the region of coxae I–IV and a separate ventri-anal shield posterior to coxae IV or, by a holovenral shield, i.e. a fused sterniti-genital and ventri-anal shield. The genital orifice is prae-sternal.

*Stigmata, peritremes and peritrematal shields*. The stigmata, one on each side of the idiosoma, are situated between coxae III and IV. The peritremes are well-developed and extend beyond the level of coxae I. Each forms a U-shaped loop in the region of the stigma (Text-fig. 6). The peritrematal shield is fused anteriorly with the dorsal shield, but is free in its proximal half.

*Gnathosoma*. The gnathosoma is typical of that found in the free-living Gamasina. Ventrally, it is provided with four pairs of setae and a distinct ventral or capitular groove (Text-fig. 7). The latter has five to seven transverse rows of denticles. The corniculi are well-developed and the internal malae long and pilose. The salivary styli are also prominent. The five free segments of the pedipalp bear simple, rod-like or spatulate setae. The chaetotactic formula for the trochanter, femur and genu is



FIGS. 6-9. *Macrocheles muscaedomesticae* (Scopoli), female. Fig. 6, lateral view.

Fig. 7, venter of gnathosoma. Fig. 8, tectum. Fig. 9, chelicera.

Abbreviations: *c.s.*, capitular seta; *d.sh.*, dorsal shield; *ext. mg.*, extra-marginal series; *ext.p.r.*, external posterior rostrals; *int.p.r.*, internal posterior rostrals; *per.*, peritreme; *per.sh.*, peritrematal shield; *r.*, rostral seta; *st.*, stigma.

2-5-6. The specialized seta on the inner basal angle of the palptarsus is three-pronged. This segment also bears a conspicuous long, upright, rod-like seta distally.

The tectum is extremely variable in form. In the majority of the species it consists of three anteriorly directed processes. These may be free (Text-fig. 8) or each lateral process partly fused with the median (Text-fig. 31). The lateral processes may be smooth and entire or divided and serrated. The median process is usually strongly setose and bifurcate distally. In *Macrocheles superbus* Hull and *Geholaspis* s. str. the tectum is simply produced into a single anteriorly directed process, variously divided distally (Text-figs. 57 and 64).

The chelicerae in both sexes are chelate-dentate. The teeth are massive and ridged, or conical and smooth. The *pilus dentilis*, dorsal seta and pore, lyriiform pore and ventral setae are well-developed. In the male the movable digit is provided with a strong spermatophoral process. This may be long and slender or short and inflated (Text-figs. 39 and 60).

*Ambulatory appendages.* All the legs are six-segmented with the ultimate segment incompletely divided into a metatarsus and tarsus. Leg I is without an ambulacral apparatus (pulvillus and claws) and terminates in a number of sensory setae. This is a characteristic feature of the family. Legs II-IV, however, have well-developed lobate pulvilli and claws. In the females, spurs are present on the femur and tarsus of leg II in the genus *Holostaspella* only (Text-fig. 85). The femur, genu and tibia of Leg II and often one or more segments of leg IV are spurred in the males.

#### CLASSIFICATION

Trägårdh (1952) divided the *Macrochelidae* into three subfamilies as follows :

- " 1. Metasternal shields connected with the sternal shield through a narrow bridge  
*Protoholaspinæ* Trägårdh, 1949  
 —. Metasternal shields free . . . . . 2.  
 2. Peritrematic shields not fused with the exopodal shields *Macrochelinae* Trägårdh, 1949  
 —. Peritrematic shields fused with the exopodal shields . . . *Areolaspinæ* nov. subfam."

The genus *Protoholaspis* Trägårdh 1949, the only member of the *Protoholaspinæ*, is not a typical Macrochelid in that leg I is provided with an ambulacrum and the chelicera lacks the characteristic ventral seta. Further, Trägårdh was unable to see the structure of the specialized seta on the inner basal angle of the palptarsus, so that the exact systematic position of the genus must remain in doubt pending the re-examination of the type. The family should, therefore, be considered to consist of the two subfamilies separated in couplet 2 of the above key.

The majority of the British species belong to the *Macrochelinae* ; the *Areolaspinæ* being represented by *Holaspulus tenuipes* Berl. and *Parholaspis* sp., which are introduced species that have become established in the Aroid House, Royal Botanic Gardens, Kew. The following separation of the four British genera of the *Macrochelinae* is based on Evans (1956) :

## Key to genera

## Females

1. Femur of leg II armed with strong spurs ; vertical setae situated on an outgrowth of the dorsal shield ; ventri-anal shield with four pairs of pre-anal setae . . . *Holostaspella* Berl.
- Femur of leg II unarmed ; vertical setae on the summit of the dorsal shield ; ventri-anal shield with 2, 3 or 5 pairs of pre-anal setae . . . . . 2.
2. Ventri-anal shield with two pairs of pre-anal setae . . . . . *Macrholaspis* Oudemans
- Ventri-anal shield with more than two pairs of pre-anal setae . . . . . 3.
3. Ventri-anal shield with three pairs of pre-anal setae . . . . . *Macrocheles* Latreille
- Ventri-anal shield with five pairs of pre-anal setae . . . . . *Geholaspis* Berl. *s. lat.*

Genus **MACROCHELES** Latreille

*Macrocheles* Latreille, P. (1829). In Cuvier, *Règne anim.*, Ed. 2, 4 : 282.

*Coprholaspis* Berlese, A. (1918). *Redia*, 13 : 146.

*Nothrholaspis* Berlese, A. (1918). *Redia*, 13 : 169.

*Dissololncha* Falconer, W. (1923). *Naturalist, Lond.* : 151.

*Monoplites* Hull, J. E. (1925). *Ann. Mag. nat. Hist.* (9), 15 : 215.

Berlese (1918) divided the genus *Macrocheles* into four subgenera, namely, *Macrocheles* s. str., *Coprholaspis*, *Nothrholaspis* and *Geholaspis*. Sellnick (1940) has shown conclusively that *Coprholaspis* is a synonym of *Macrocheles* s. str. and, within recent years, *Geholaspis* has been given generic status. The remaining two subgenera have been separated, chiefly, by the ornamentation of the sternal shield in the female. In the majority of the species of *Macrocheles* s. str., this shield is ornamented with distinct lines or punctate lines whereas in *Nothrholaspis* the ornamentation takes the form of a network of ridges (cf. Pl. 1, fig. 3 and Pl. 3, fig. 15). This distinction is not as definite as supposed by Berlese and, as is often the case with a general character of this nature, an intermediate group, containing species which could belong to either subgenus, is apparent. In view of this, and until a more comprehensive study can be made of both sexes of the known *Macrocheles* species, especially those in the Berlese Collection, the writers feel it advisable to combine the subgenus *Nothrholaspis* with *Macrocheles*.

Ecologically, the British species of this genus may be divided into two groups : those living in dung and those inhabiting leaf litter or mosses. The former contains a number of phoretic species, e.g. *M. muscaedomesticae* and *Macrocheles glaber* (Müller), in which the shape and chaetotaxy of the dorsal shield in the male differs considerably from that in the female.

The genus *Macrocheles* may be defined as follows : Dorsal shield in both sexes entire with usually twenty-eight<sup>1</sup> pairs of setae and twenty-two pairs of "pores." Sternal shield in the female with three pairs of setae ; metasternal shields free. Genital shield with a pair of setae and accessory sclerites. Ventri-anal shield with three pairs of pre-anal setae in addition to the three setae normally associated with the anus. Male with sterniti-geniti-ventral shield and separate ventri-anal or with holovenal

<sup>1</sup> *Macrocheles montanus* (Willmann) has twenty-nine to thirty-one pairs of setae on the dorsal shield, and in some males the number of setae may be increased through the lateral extension of the shield to incorporate a number of the extra-marginal setae.

shield. Genital orifice prae-sternal. Hypostome with well-developed corniculi and salivary styli. Pedipalps with five free segments; chaetotaxy of trochanter, femur and genu being (2-5-6). Specialized seta on the palptarsus with three prongs. Chelicerae chelate dentate with a well developed brush of setae ventro-laterally; movable digit in the male with a strong spermatophoral process. Legs I without ambulacra; legs II and often legs IV, spurred in the male.

TYPE: *Acarus marginatus* Hermann, 1804 (= *Acarus muscae domesticae* Scopoli, 1772).

*Key to the Females of the British Species of Macrocheles Latr.*

1. Setae L<sub>3</sub> to L<sub>5</sub> and Mg<sub>3</sub> to Mg<sub>6</sub> simple . . . . . 2.
- Setae L<sub>3</sub> to L<sub>5</sub> and Mg<sub>3</sub> to Mg<sub>6</sub> serrate, plumose or pectinate<sup>1</sup> . . . . . 8.
2. Setae D<sub>8</sub> simple or pilose . . . . . 3.
- Setae D<sub>8</sub> short, comb-like (Text-fig. 11); sternal shield weakly ornamented; ventri-anal shield considerably longer than broad; fixed digit of the chelicera with a row of 5 or 6 small teeth distally (Text-fig. 13) . . . . . *Macrocheles pisentii* (Berl.)
3. Vertical setae (D<sub>1</sub>) stout and plumose or long and setiform (Text-fig. 22). Dorsal shield more than 600 $\mu$  in length . . . . . 4.
- Vertical setae short spine-like (Text-fig. 24). Dorsal shield less than 500 $\mu$  in length . . . . . 7.
4. Vertical setae short and stout, plumose distally; setae D<sub>4</sub>, L<sub>1</sub>, L<sub>2</sub>, L<sub>6</sub> and Mg<sub>1</sub> simple (Text-fig. 17); tibia I approximately equal in length to tarsus (1:1.0-1.05) . . . . . 5.
- Vertical setae long setiform (Text-fig. 15) with inconspicuous serrations distally; sternal shield densely punctured; setae D<sub>4</sub>, L<sub>1</sub>, L<sub>2</sub>, L<sub>6</sub> and Mg<sub>1</sub> pectinate; tibia I shorter than tarsus I (1:1.2-1.44) . . . . . *Macrocheles rothamstedensis* sp. nov.
5. Sternal shield with deeply incised transverse median and posterior oblique lines (Pl. 1, fig. 3); dorsal setae, except D<sub>1</sub>, D<sub>4</sub> and L<sub>2</sub>, simple . . . . . *Macrocheles glaber* (Müller)
- Sternal shield punctured, transverse median and posterior oblique lines poorly developed or absent; setae D<sub>4</sub> simple . . . . . 6.
6. Ventral shields densely punctured (Pl. 1, fig. 4); setae Mg<sub>2</sub>, Mg<sub>7</sub>, Mg<sub>9</sub> and D<sub>8</sub> distinctly serrated (Text-fig. 21) . . . . . *Macrocheles punctoscutatus* sp. nov.
- Sternal shield with fewer large punctures (Pl. 1, fig. 5); setae D<sub>1</sub>, D<sub>8</sub> and L<sub>2</sub> only serrate or pectinate . . . . . *Macrocheles subbadius* (Berl.)
7. Sternal shield ornamented with large punctures (Pl. 1, fig. 6) . . . . . *Macrocheles insignitus* Berl.
- Sternal shield weakly ornamented with punctate lines (Pl. 2, fig. 7) . . . . . *Macrocheles merdarius* (Berl.)
8. Dorsal shield with 29<sup>2</sup> or more pairs of setae (Text-fig. 27); median pre-anal seta on or slightly off the line connecting the anterior and posterior pre-anals (Pl. 2, fig. 8) . . . . . *Macrocheles montanus* (Willmann)
- Dorsal shield with 28 pairs of setae . . . . . 9.
9. Vertical setae situated in close proximity to each other, so that their bases are more or less contiguous (Text-fig. 5) . . . . . 10.
- Vertical setae further apart, their bases distinctly separated, i.e. at least the diameter of the setal base apart . . . . . 12.
10. Lateral and marginal setae slender, plumose only in their distal third (Text-fig. 5); sternal shield with distinct lines (Pl. 1, fig. 1); lateral processes of the tectum free (Text-fig. 8) . . . . . *Macrocheles muscaedomesticae* (Scopoli)

<sup>1</sup> Except in *Macrocheles submotus* Falconer in which Mg<sub>4</sub> is simple and Mg<sub>5</sub> and 6 pilose.

<sup>2</sup> This species is characterised by having nine pairs of setae in the D series.

- Lateral and marginal setae strongly plumose in their distal two-thirds; lateral processes of the tectum partially fused . . . . . 11.
- 11. With three pairs of platelets between ventri-anal and genital shields (Pl. 2, fig. 9) . . . . . *Macrocheles carinatus* (C. L. Koch)
- Without platelets between ventri-anal and genital shields . . . . . *Macrocheles penicilliger* (Berl.)
- 12. Setae D<sub>2</sub>, Mg<sub>2</sub> and Mg<sub>4</sub> simple (Text-fig. 36) . . . . . *Macrocheles submotus* Falconer
- Setae D<sub>2</sub>, Mg<sub>2</sub> and Mg<sub>4</sub> plumose . . . . . 13.
- 13. Setae M<sub>1</sub> simple, approximately equal in length to D<sub>1</sub> and extending beyond the bases of D<sub>2</sub> by about one-half their length (Text-fig. 42) . . . . . *Macrocheles tardus* (C. L. Koch)
- Setae M<sub>1</sub> simple or plumose and considerably shorter in length than D<sub>1</sub> . . . . . 14.
- 14. Dorsal shield less than 950 $\mu$  in length . . . . . 15.
- Dorsal shield more than 1100 $\mu$  in length . . . . . 16.
- 15. Setae Mg<sub>10</sub>, approximately equal in length to D<sub>8</sub>, are about half the length of Mg<sub>9</sub> (Text-fig. 44); external margin of the lateral processes of the tectum smooth anterior to the base of the median process (Text-fig. 45); punctate areas on the sternal shield inconspicuous . . . . . *Macrocheles decoloratus* (C. L. Koch)
- Setae Mg<sub>10</sub> equal in length to Mg<sub>9</sub> (Text-fig. 47); external margin of the lateral processes of the tectum serrate well beyond the base of the median process (Text-fig. 48); punctate areas on the sternal shield large, conspicuous . . . . . *Macrocheles matris* Hull
- 16. Setae M<sub>1</sub> plumose and lying in line with setae D<sub>1</sub> (Text-fig. 50); lateral margins of the dorsal shield coarsely and unevenly serrated (Text-fig. 51); ventri-anal shield considerably broader than long and characteristically shaped (Pl. 3, fig. 15) . . . . . *Macrocheles plumiventris* Hull
- Setae M<sub>1</sub> simple and lying in line with D<sub>2</sub> (Text-fig. 56); lateral margins of the dorsal shield minutely and evenly serrated (Text-fig. 55); ventri-anal shield considerably longer than broad . . . . . *Macrocheles superbus* Hull

### *Macrocheles muscaedomesticae* (Scopoli) Sellnick.

*Acarus muscae domesticae* Scopoli, J. A. (1772). *Annus. V. Hist. Nat.* : n. 125, 157.

*Acarus marginatus* Hermann, J. F. (1804). *Mém. Apt.* : 76, figs.

*Macrocheles muscae domesticae*, Sellnick, M. (1940). *Göteborg. Vetensk. Samh. Handl.* (5) 6B, No. 14 : 78, figs.

*Macrocheles muscaedomesticae*, Pereira, C. & de Castro, M. P. (1945). *Arq. Inst. Biol. S. Paulo* 16 : 163, figs.

*Female.* Dorsal shield reticulated and bearing twenty-eight pairs of setae and twenty-two pairs of "pores" (Text-fig. 5). Vertical setae plumose in their distal third and lying in close proximity to each other. Setae D<sub>5</sub>–D<sub>7</sub>, M<sub>1</sub>, M<sub>3</sub> and M<sub>4</sub> simple. The remainder of the setae on the dorsal shield are pilose in their distal third. The distribution of the setae and pores is shown in the figure. Extra-marginal setae are simple (Text-fig. 6).

The sternal shield is characteristically ornamented with punctures and ridges (Pl. 1, fig. 1.) All the sternal setae are simple. The metasternal shields are free and each carries a simple seta. Genital shield, truncate posteriorly, bears a simple pair of setae and is ornamented with punctate lines. The ventri-anal shield (approx. 368  $\times$  379 $\mu$ ) has a loose network of punctate lines. All the setae on this compound shield are simple. The peritrematal shield is free posteriorly; being separated from

the exopodal shields by a wide expanse of striated cuticle (Text-fig. 6). The peritreme extends beyond coxa I.

The gnathosoma is strongly sclerotized and carries four pairs of setae ventrally (Text-fig. 7). The ventral groove is provided with six or seven transverse rows of denticles. Anteriorly the corniculi and salivary stylets are strongly developed. The chaetotaxy of the five free segments of the pedipalp is normal for the free-living *Gamasina*. The specialized seta on the inner basal angle of the palptarsus is three-pronged. The lateral processes of the tectum are free; the median process is bifid distally (Text-fig. 8). The chelicerae are massive; the movable digit being tridentate and the fixed bi- or tridentate (Text-fig. 9).

Leg I has the tarsus ( $187\mu$ ) longer than the tibia ( $165\mu$ ).

*Male*. This sex and the immature stages are described and figured by Pereira & de Castro (1945).

*Dimensions*. Female: length  $980-1014\mu$ ; breadth  $570-671\mu$ . Male: length  $750-900\mu$ ; breadth  $450-600\mu$ .

*HABITAT AND LOCALITY*. This species is commonly found on *Musca domestica* Linn. and allied species. Pereira & de Castro (1945) state that all instars except the larval feed on the eggs of house flies. *M. muscaedomesticae* is cosmopolitan in distribution.

### *Macrocheles pisentii* (Berl.)

*Gamasus tardus* var. *Pisentii* Berlese, A. (1882). *Bull. Soc. ent. Ital.* **14**: 112, fig.

*Holostaspis Pisentii* Berlese, A. (1887). *Acari, Myriopoda et Scorpiones, etc.*, Fasc. 76, N. 1.

*Female*. Dorsal shield, minutely punctured, and bearing twenty-eight pairs of setae. Vertical setae simple and well separated from each other (Text-fig. 10). Setae D8 short and comb-like (Text-fig. 11). The remainder of the setae on the dorsal shield long and sharply pointed distally. Extra-marginal setae simple.

Ventrally, the sternal shield (without distinct ornamentation) has three pairs of simple setae. Its posterior margin is strongly concave. Metasternal shields small; setae simple. Genital shield with well-developed lateral sclerites, Ventri-anal shield (about  $285 \times 220\mu$ ) is considerably longer than broad. All the setae on this shield are simple.

External posterior rostrals are about one-third the length of the internals. The ventral groove has five transverse rows of denticles. The characteristic form of the tectum is shown in Text-fig. 12. The fixed digits of the chelicerae are provided with one large, grooved tooth and five or more small teeth (Text-fig. 13). The movable digit is tridentate; the middle tooth being large and recurved.

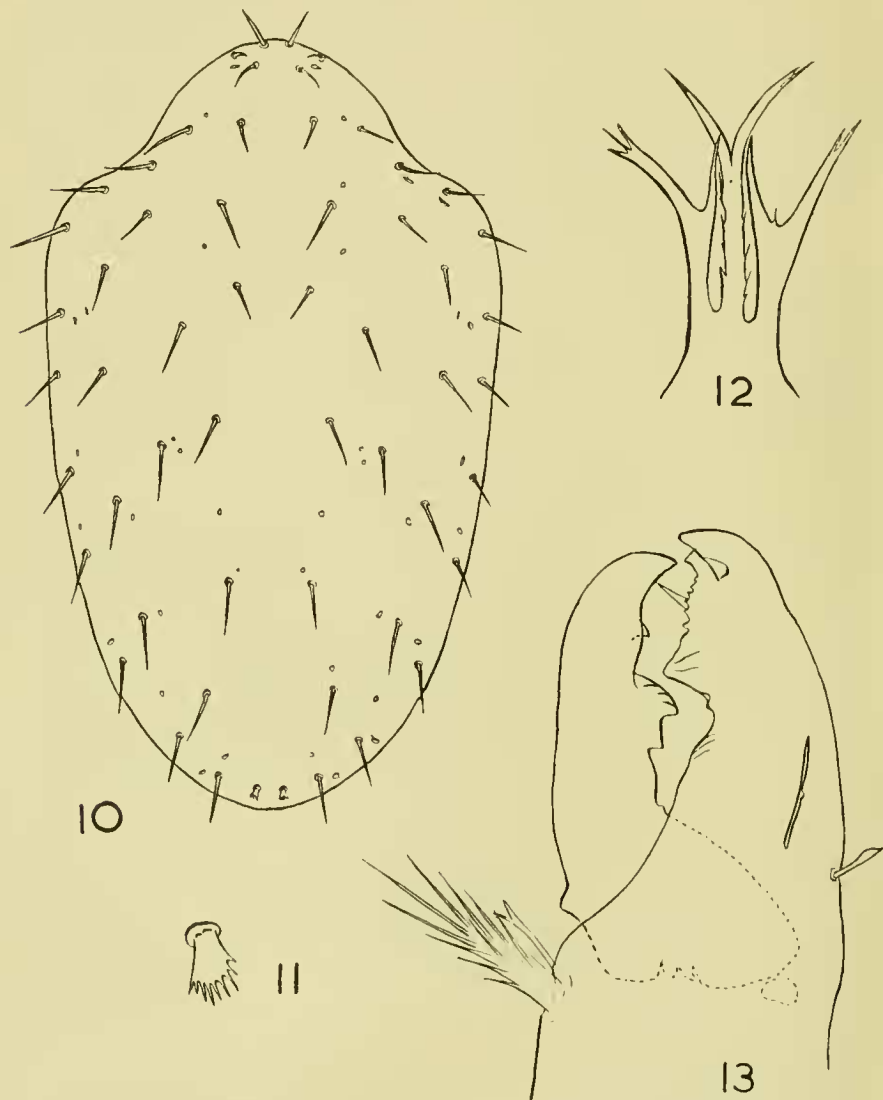
Leg I has the tarsus ( $143\mu$ ) longer than the tibia ( $132\mu$ ). Tarsus II is provided with stout spines.

*Male*. Unknown.

*Dimensions*. Female: length  $810-835\mu$ ; breadth  $490-506\mu$ .

*HABITAT AND LOCALITY*. This species has been collected from *Scarabaeus semipunctatus* in Italy. Hull (1918) records it from a nest of *Formica rufa* at Chopwell,

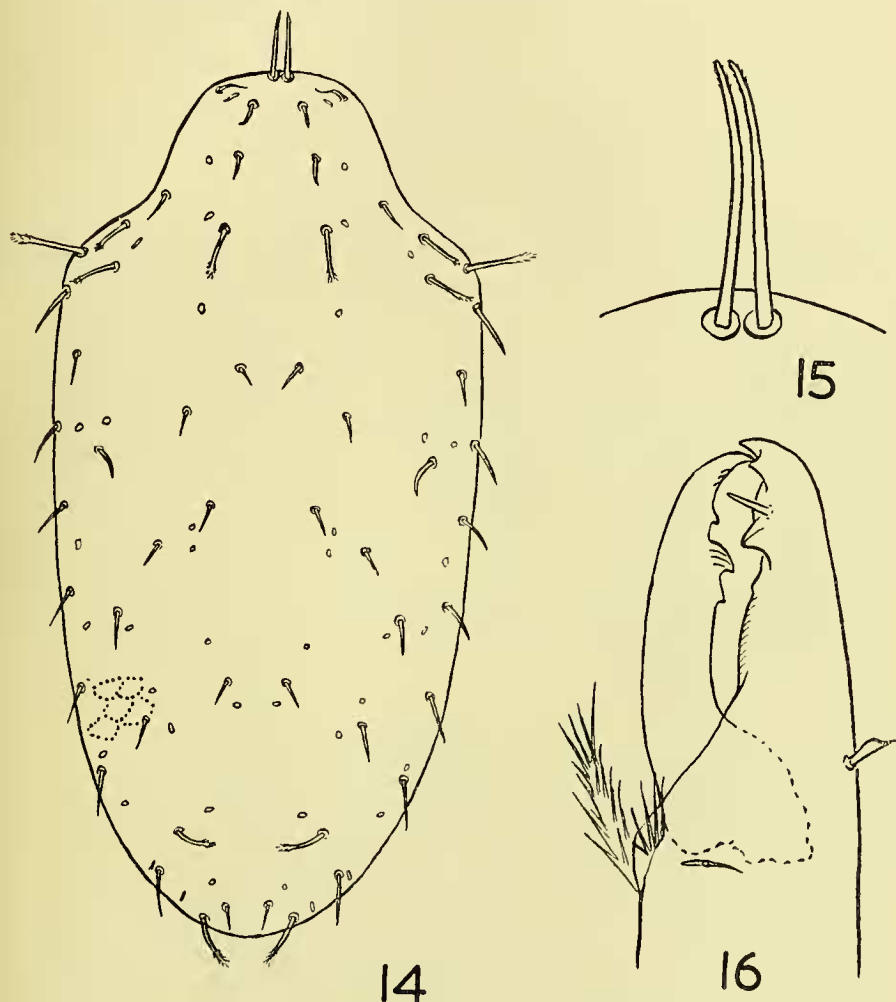
Durham ; from moss at Ninebanks, Northumberland ; and in dead leaves, Cheshire. We have not examined Hull's specimens. The above description and figures are based on specimens in the Oudemans Collection, Leiden.



FIGS. 10-13. *Macrocheles piscinii* (Berl.), female. Fig. 10, dorsal shield ; Fig. 11, seta D8 enlarged. Fig. 12, tectum. Fig. 13, chelicera.

*Macrocheles rothamstedensis* sp. nov.

FEMALE. Dorsal shield, with twenty-eight pairs of setae and twenty-two pairs of "pores", is weakly ornamented with punctate lines forming a polygonal network (Text-fig. 14). The vertical setae are long and slightly pilose distally; their bases are almost contiguous (Text-fig. 15). Setae D<sub>4</sub>, L<sub>1</sub>, L<sub>2</sub>, L<sub>6</sub>, Mg<sub>1</sub> and Mg<sub>10</sub> are conspicuously pilose distally, other dorsal setae may show slight pilosity distally. All the extra-marginal setae are simple.



FIGS. 14-16. *Macrocheles rothamstedensis* sp. nov., female. Fig. 14, dorsal shield. Fig. 15, setae D<sub>1</sub> enlarged. Fig. 16, chelicera.

The sternal shield is densely covered with punctures which tend to form a pattern of punctate lines (Pl. 1, fig. 2). All the sternal setae are simple. The smooth metasternal setae lie on small narrow shields. The genital shield, with a pair of simple setae, is truncate posteriorly and ornamented with a network of punctate lines. The lateral sclerites are strongly formed. The ventri-anal shield (approx.  $250 \times 198\mu$ ) is longer than broad and ornamented with a loose network of punctate lines. All the setae on this shield are simple. The metapodal shields are small and weakly sclerotised.

The venter of the gnathosoma is minutely punctured. The ventral groove is provided with five rows of denticles. Each lateral process of the tectum is free. The movable digit of the chelicera is tridentate; the fixed digit is basically bidentate (Text-fig. 16).

Leg I (approx.  $610\mu$  in length) with the tibia ( $110\mu$ ) evidently shorter than the tarsus ( $143\mu$ ). Legs II and III with simple setae; leg IV with plumose setae on the femur, genu, tibia and tarsus.

MALE. Dorsal shield, strongly attenuated posterior to coxae IV, bears thirty pairs of setae. The chaetotactic pattern differs from that in the female in the addition of two pairs of extra-marginal setae to the shield and the greater distance between the verticals. The ornamentation of the shield is similar to that in the female.

The venter is covered by a punctured holoventral shield bearing nineteen simple setae.

The tectum is basically the same as in the female. The fixed digit of the chelicera is tridentate and the movable is provided with two or three small teeth. The spermatophoral process is about the length of the movable digit.

Femur, genu and tibia of leg II and the femur and tibia of leg IV are spurred. Femur II and trochanter IV have small sclerotized ridges.

DIMENSIONS. Male: length  $590-595\mu$ ; breadth  $365-370\mu$ . Female; length  $710-740\mu$ ; breadth  $370-375\mu$ .

HABITAT AND LOCALITY. Seven females and three males from bullock manure, Rothamsted Experimental Station, Harpenden, Herts. Holotype female, 1955.10.22.43; allotype male, 1955.10.22.44 and paratypes, 1955.10.22.45-52.

### *Macrocheles glaber* (Müller)

*Holostaspis glabra* Müller, J. (1860). *K. K. mähr. schles. Ges. Brünn*: 178, figs.

*Gamasus stercorarius* Kramer, P. (1876). *Arch. Naturgesch.* **42**: 95, fig.

*Holostaspis badius*, Berlese, A. (1889). *Acari, Myriopoda etc.*, fasc. 52, N. 3.

*Macrocheles marginatus* var. *littoralis* Halbert, J. N. (1915). *Proc. Roy. Irish Acad.* **31**, 39 ii: 67, fig.

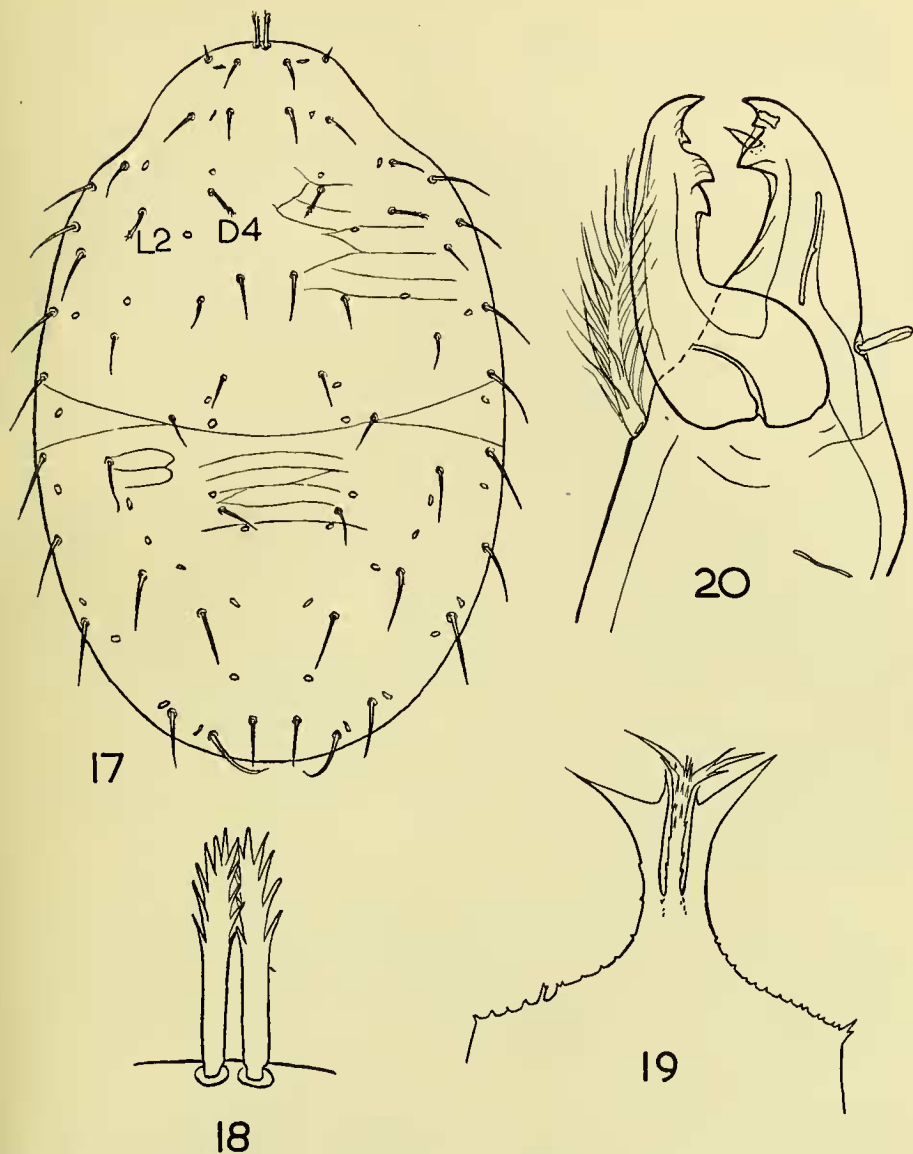
*Macrocheles (Copholaspis) glaber* Berlese, A. (1921). *Redia* **14**: 85.

<sup>1</sup>*Macrocheles (Monoplites) oudemansii* Hull, J. E. (1925). *Ann. Mag. nat. Hist.* (9) **15**: 215. (in part)

*Macrocheles veterrimus* Sellnick, M. (1940). *Göteborg. Vetensk. Samh. Handl.* (5) **6B**: 80, figs.

*Copholaspis anglicus* Turk, F. A. (1946). *Ann. Mag. nat. Hist.* (11) **12**: 791, figs. *syn. nov.*

<sup>1</sup> Hull proposed this name for *Macrocheles marginatus* Oudemans, 1901 nec Herman, 1804. This "species," however, is a complex of at least two distinct species: the tritonymph being *M. glaber* and the adult, *M. plumiventris*.



FIGS. 17-20. *Macrocheles glaber* (Müller), female. Fig. 17, dorsal shield. Fig. 18, setae D1 enlarged. Fig. 19, tectum. Fig. 20, chelicera.

FEMALE. The dorsal shield is weakly reticulated and punctured, and carries twenty-eight pairs of setae and twenty-two pairs of "pores" (Text-fig. 17). The vertical setae, lying in close proximity to each other, are plumose in their distal half. Setae D8 are finely pilose, and D4 and L2 spiculate distally. The remainder of the setae on the shield are smooth and sharply pointed. The extra-marginal setae are simple and curved.

The tritosternum is normal. The sternal shield is characteristically ornamented with lines and punctate areas (Pl. 1, fig. 3). The transverse anterior, arcuate, transverse median and oblique lines are well defined. All the sternal setae are simple. The metasternal shields are small and the setae simple. The genital shield is strongly ornamented and provided with well-developed accessory sclerites. The ventri-anal shield (approx.  $264\text{--}275\mu$  long  $\times$   $265\text{--}295\mu$  wide) is ornamented with concentric punctate lines. The median pre-anal setae are situated well outside the connecting line between the anterior and posterior pre-anals. All the setae on the ventri-anal are simple. The metapodal shields are irregular in outline. The peritreme and peritrematal shield are normal for the genus.

The gnathosoma bears four pairs of setae ventrally. The internal posterior rostrals are about four times the length of the externals. The ventral groove has six transverse rows of denticles. The pedipalps are normal. The tectum is produced into three distinct processes; the median being divided distally (Text-fig. 19). The chelicerae are strongly developed. The fixed digit is bidentate with the proximal tooth large and ridged (Text-fig. 20). The pilus dentilis is relatively short and stout. The movable digit is tridentate. The dorsal seta is comb-like distally.

Leg I ( $585\mu$ ) has plumed setae on the dorsal surface of the femur and genu. The tibia and tarsus are approximately equal in length (about  $115\mu$ ). Legs II ( $510\mu$ ), III ( $460\mu$ ) and IV ( $760\mu$ ) have a few plumose setae on the femur and tarsus.

MALE. This sex is figured by Berlese (1889).

*Dimensions.* Female: length  $850\text{--}855\mu$ ; breadth  $540\text{--}560\mu$ .

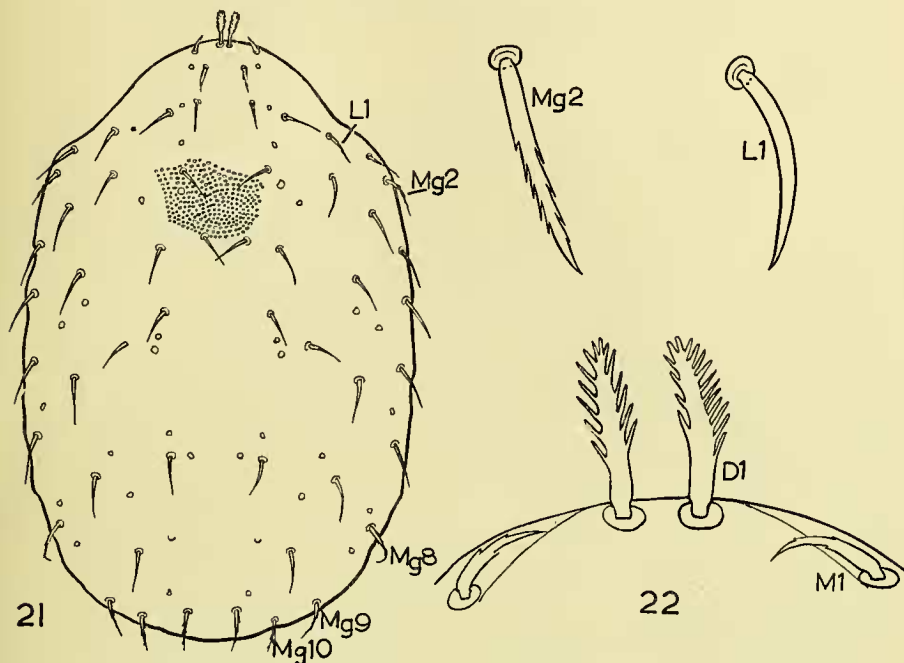
HABITAT AND LOCALITY. This is one of the commonest species of mites found on "dor" beetles in Europe, especially on *Geotrupes stercorarius* Linn. It is also commonly encountered on Muscid flies.

### *Macrocheles punctoscutatus* sp. nov.

FEMALE. Dorsal shield densely covered with minute punctures and bearing twenty-eight pairs of setae and twenty-two pairs of "pores" (Text-fig. 21). Vertical setae coarsely plumose, well separated (Text-fig. 22). The majority of dorsal setae smooth and sharply pointed apically; setae D8, Mg2, Mg8-10 distinctly pilose. Extra-marginal setae simple.

Tritosternum normal, lacinae long and pilose. Sternal shield heavily ornamented, punctate areas conspicuous (Pl. 1, fig. 4). All sternal setae simple. Metasternal shields small, metasternal setae simple. Genital shield strongly ornamented, genital setae simple. Ventri-anal shield ( $320\mu \times 355\mu$ ) broader than long with its anterior margin lying in close proximity to the genital shield. The ornamentation of the

shield consists of distinct lines forming a loose network, and numerous small punctures. The pre-anals, para-anals and post-anal setae are simple. The metapodals are small and elongate; their long axis lying more or less parallel with that of the longer axis of the body.



FIGS. 21–22. *Macrocheles punctoscutatus* sp. nov., female. Fig. 21, dorsal shield. Fig. 22, setae D1 and M1 enlarged.

The external posterior rostral setae are about one-half the length of the internals. The ventral groove has five transverse rows of denticles. The dentition of the chelicerae and the structure of the tectum are similar to that in *M. glaber*.

Leg I ( $605\mu$ ) has the tibia and tarsus of about equal length.

DIMENSIONS. Length  $880\mu$ ; breadth  $605\mu$ .

HABITAT AND LOCALITY. A single female (holotype 1955.10.22.70) from a mole's nest at Churcham, Gloucestershire (Coll. R. S. George).

### *Macrocheles subbadius* (Berl.)<sup>1</sup>

*Holostaspis subbadius* Berlese, A. (1904). *Redia* 1: 264.

FEMALE. Dorsal shield bears twenty-eight pairs of setae and twenty-two pairs of "pores" (Text-fig. 23). The vertical setae are plumose distally. Setae D8 and,

<sup>1</sup> This species is figured by Berlese (1889) under *Holostaspis marginatus* (Herm.) Berl. "forma intermedia inter badium et adultum (marginatum) foem" in *Acari Myriopoda*, etc., fasc. 52, N. 6.

in the majority of the specimens examined, setae L2 are pilose. The extra-marginal setae are simple.

The sternal shield is ornamented with distinct punctures arranged as in Pl. 1, fig. 5. The sternal, metasternal and genital setae are simple. The ventri-anal shield ( $190\text{--}220 \times 190\mu$ ) is ornamented with punctate lines; the nine setae on this shield are simple. The metapodal shields are weakly sclerotized.



FIG. 23. *Macrocheles subbadius* (Berl.), female. Dorsal shield.

The lateral processes of the tectum are free and the form of the chelicerae is essentially the same as in *M. merdarius*.

Leg I has the tibia ( $82\mu$ ) shorter than the tarsus ( $110\mu$ ). The spines on tarsus II are short and stout.

MALE. Unknown.

DIMENSIONS. Length  $610\text{--}625\mu$ ; breadth  $370\text{--}400\mu$ .

HABITAT AND LOCALITY. Berlese (1889) records this species from manure in Italy. The writers have examined specimens from farmyard manure, Evesham, Worcestershire.

### *Macrocheles insignitus* Berl.

*Macrocheles (Coprholaspis) insignitus* Berlese, A. (1918). *Redia* 13: 158.

FEMALE. Dorsal shield with twenty-eight pairs of setae and twenty-two pairs of "pores". The surface of the shield is covered with minute punctures which form a polygonal network. All the setae on the shield and the interscutal membrane are simple. The verticals are short spine-like.

Sternal shield characteristically ornamented with punctures as in Pl. 1, fig. 6. All the sternal setae are simple. The metasternals are small and flank the anterior part of the ornamented genital shield. The metasternal and genital setae are simple. The ventri-anal shield is about as broad as long ( $156 \times 152\mu$ ) and ornamented with punctate lines. The setae on this compound shield are all simple. The metapodals are extremely weakly sclerotised.

The gnathosoma is typical for the genus. The lateral processes of the tectum are free and fish-tail like; the median process is strongly bifurcate distally. The form of the chelicerae is similar to that in *M. merdarius*.

Leg I (approx.  $350\mu$  in length) has the tibia ( $55\mu$ ) considerably shorter than the tarsus ( $72\mu$ ).

The male is unknown.

DIMENSIONS. Length  $445\mu$ ; breadth  $275\mu$ .

HABITAT AND LOCALITY. This species is previously known by a single female from the type locality "Longny, Orne in Gallia" (Berlese, 1918). The writers have examined a single female of this species from "a hot bed", Austrey, Warwickshire (undetermined in the Michael Collection).

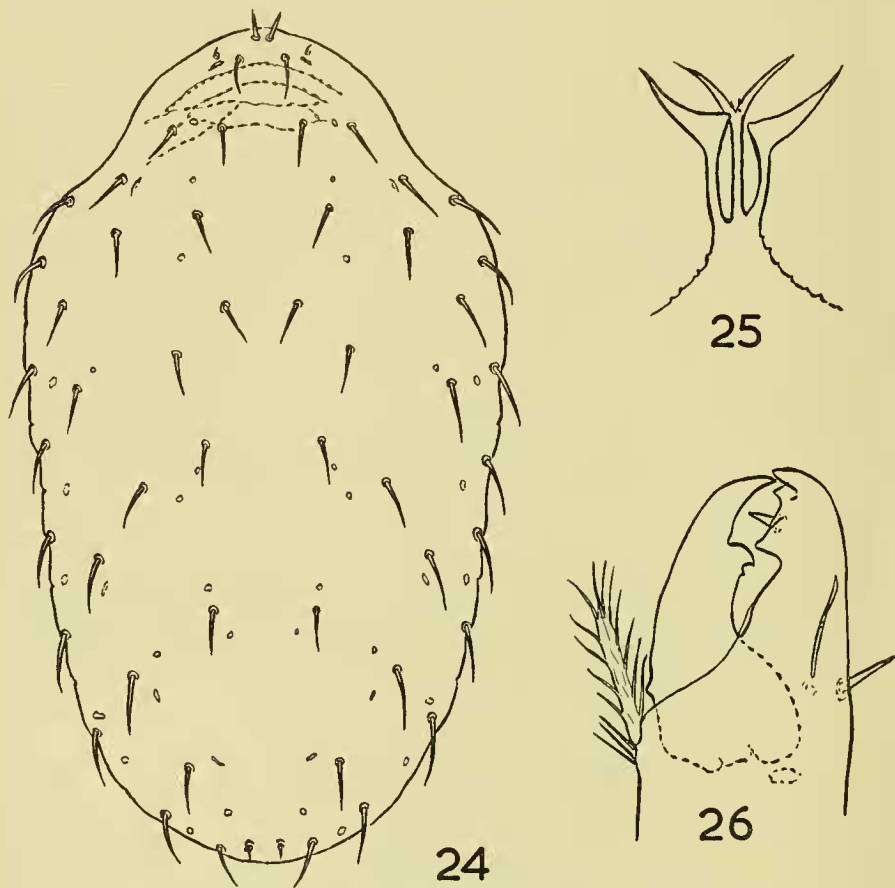
### *Macrocheles merdarius* (Berl.)

*Holostaspis merdarius* Berlese, A. (1889). *Acari, Myriopoda et Scorpiones etc.*, Fasc. 52, N. 1, fig. *Macrocheles merdarius*, Sellnick, M. (1940). Göteborg. *Vetensk. Samh. Handl.* (5) 6B: 86, figs.

FEMALE. Dorsal shield, ornamented with reticulations, is provided with twenty-eight pairs of simple setae and twenty-two pairs of pores (Text-fig. 24). The vertical setae are sub-spinose. The extra-marginal setae are also simple.

The sternal shield is lightly ornamented with punctate lines and the three pairs of sternal setae are simple (Pl. 2, fig. 7). The metasternal shields are minute. Both the metasternal and genital setae are simple. The truncated anterior margin of the ventri-anal shield lies in close proximity to the posterior margin of the genital. The ventri-anal (about  $150 \times 126\mu$ ) is ornamented with four or five transverse lines. All the setae on this shield are simple. The metapodals are small and weakly sclerotized.

Ventral groove with five transverse rows of denticles. External posterior rostrals about one-third the length of the internals. The tectum has the lateral processes free (Text-fig. 25). The median process is deeply bifurcate. The dentition of the digits of the chelicerae is shown in Text-fig. 26.



FIGS. 24-26. *Macrocheles merdarius* (Berl.), female. Fig. 24, dorsal shield.  
Fig. 25, tectum. Fig. 26, chelicera.

MALE. This sex is described and figured by Berlese (1889).

DIMENSIONS. Female: length  $445-490\mu$ ; breadth  $225-280\mu$ . Male: length  $380\mu$ ; breadth not given by Berlese (1889).

HABITAT AND LOCALITY. This is one of the commonest species of Macrochelids occurring in dung and compost. It has been recorded from a number of localities in

Europe (Franz, 1954). In Britain it is recorded from bullock dung at Rothamsted Experimental Station, Harpenden, Herts. (Hyatt, 1956).

*Macrocheles montanus* (Willmann)

*Nothrolaspis montana* Willmann, C. (1951). *Bonner Zool. Beitr.* 2: 158, figs.

FEMALE. Dorsal shield with twenty-nine pairs of setae and twenty-two pairs of "pores" (Text-fig. 27). The surface of the shield is conspicuously punctated and

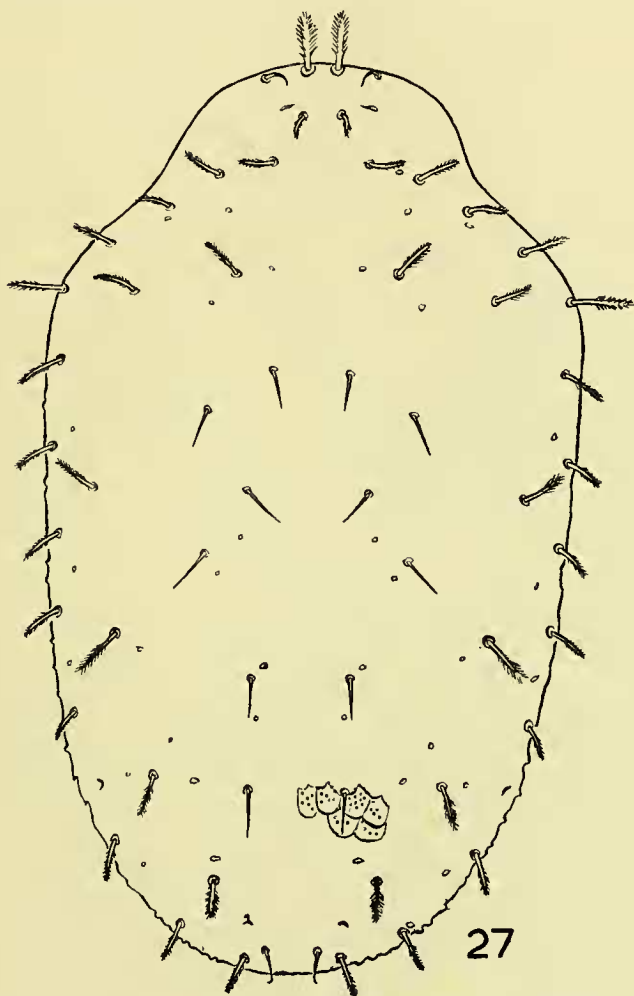


FIG. 27. *Macrocheles montanus* (Willmann), female. Dorsal shield.

reticulated. Dorsal series (D) comprising nine pairs of setae. Vertical setae strongly plumose with their bases well separated. Setae M<sub>1</sub>, D<sub>5</sub>–D<sub>8</sub>, M<sub>3</sub> and M<sub>4</sub> and the additional setae of the D series are simple. The remainder of the dorsal setae are plumose. Extra-marginal setae are simple.

The sternal shield is covered with punctures which are larger in the posterior third of the shield (Pl. 2, fig. 8). The first pair of sternal setae are plumose in their distal third; the second and third pairs are smooth or slightly plumose distally. The form of the metasternal and genital shield is shown in the figure. Ventri-anal shield (357 ×

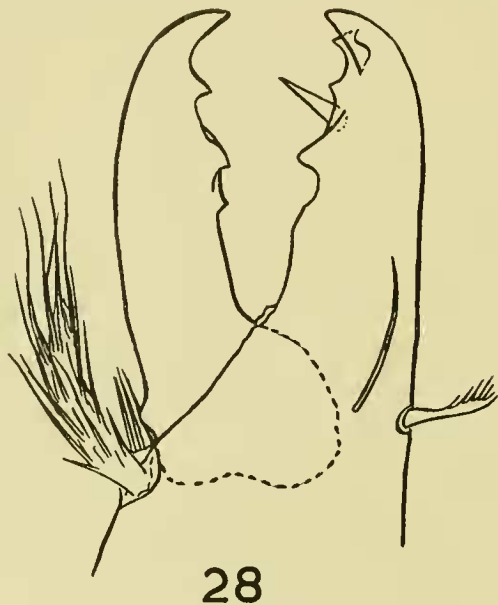


FIG. 28. *Macrocheles montanus* (Willmann), female. Chelicera.

340 $\mu$ ) is ornamented with a network of punctate lines. The median pre-anal seta lies almost on the line connecting the anterior and posterior pre-anals. The pre-anal and para-anal setae are simple, the post-anal seta is strongly plumose distally. There are three pairs of platelets between the genital and ventri-anal shields. The metapodal shields are weakly sclerotized.

Venter of the gnathosoma normal for the genus. Tectum essentially the same as in *M. submotus* (Text-fig. 37). Both digits of the chelicerae tridentate (Text-fig. 28).

Leg I with the tarsus (175 $\mu$ ) longer than the tibia (154 $\mu$ ).

The male is unknown.

DIMENSIONS. Length 1,050–1,140 $\mu$ ; breadth 660 $\mu$ .

HABITAT AND LOCALITY. This species is previously known from Austria only

(Willmann, 1951 and Franz, 1954). We have examined a single female collected under "old wet oak bark" in Marley Wood, Wytham, Berkshire (Coll. E. W. Fager).

*M. montanus* is the only British species in the genus which has more than the normal complement of setae on the dorsal shield. In Willmann's figure of the type specimen there are thirty-one pairs of setae on the shield; additional plumose setae being present near setae L7 and L9 as well as the simple pair in the D series. In other characters the British specimen agrees with the type.

### *Macrocheles carinatus* (C. L. Koch).

*Gamasus carinatus* Koch, C. L. 1839. *Deutsch. Crust. Myr. Arach. fasc.* 24, t. 16.

*Macrocheles hypochthonius* Oudemans, A. C. 1913. *Ent. Ber. Amst.* 4: 6.

*Macrocheles hypochthonius* Oudemans, A. C. 1914. *Arch. Naturgesch.* 79A, Hft. 8: 175, figs.

*Nothrolaspis hulli* Falconer, W. 1923. *Naturalist Lond.*: 153, figs. *syn. nov.*

*Nothrolaspis carinata* Sellnick, M. 1931. *SB. Akad. Wiss, Wien* 140: 766, figs.

**FEMALE.** The dorsal shield is strongly reticulated and punctured, and its lateral margins serrated (Text-fig. 29). The vertical setae (D1) which stand in close proximity to each other, are long and strongly plumose in their distal half (Text-fig. 30). Setae M1 are short and may be smooth or plumose. Setae M3, M4, D6, D7, and D8 are thin and simple or slightly serrated distally. The remainder of the setae on the dorsal shield are strong and plumose. Setae D3 lie in advance of M2. The anterior extra-marginal setae are simple and the posterior plumose.

The sternal shield is ornamented with a network of ridges and punctures; the latter are especially large in the posterior third of the shield (Pl. 2, fig. 9). The sternal and metasternal setae are simple. The posterior margin of the genital shield is strongly convex, the genital setae are simple. The ventri-anal shield is sub-circular in outline and is strongly ornamented. All the setae on the compound shield are simple. The median pre-anals lie considerably closer to the anterior than the posterior pre-anals and are situated almost on the connecting line between these setae. The interscutal membrane between the genital and ventri-anal shield bears six platelets. The metapodal shields are small. The peritreme and peritrematal shield are normal for the genus. The interscutal membrane is conspicuously corrugated.

The external posterior rostral setae are about one-third the length of the internals. The ventral groove carries five rows of denticles. The tectum (Text-fig. 31) has the lateral lobes partially fused; the lateral and median lobes are divided distally. The chelicerae are strongly developed with the fixed digit tri-dentate (Text-fig. 32). The movable digit may be bi- or tri-dentate. The dorsal seta is serrated on one side.

Leg I, approximately 935 $\mu$  in length, has the tibia (120 $\mu$ ) considerably shorter than the tarsus (165 $\mu$ ). Legs II, III, IV measure approximately 660 $\mu$ , 605 $\mu$ , and 1,100 $\mu$  respectively.

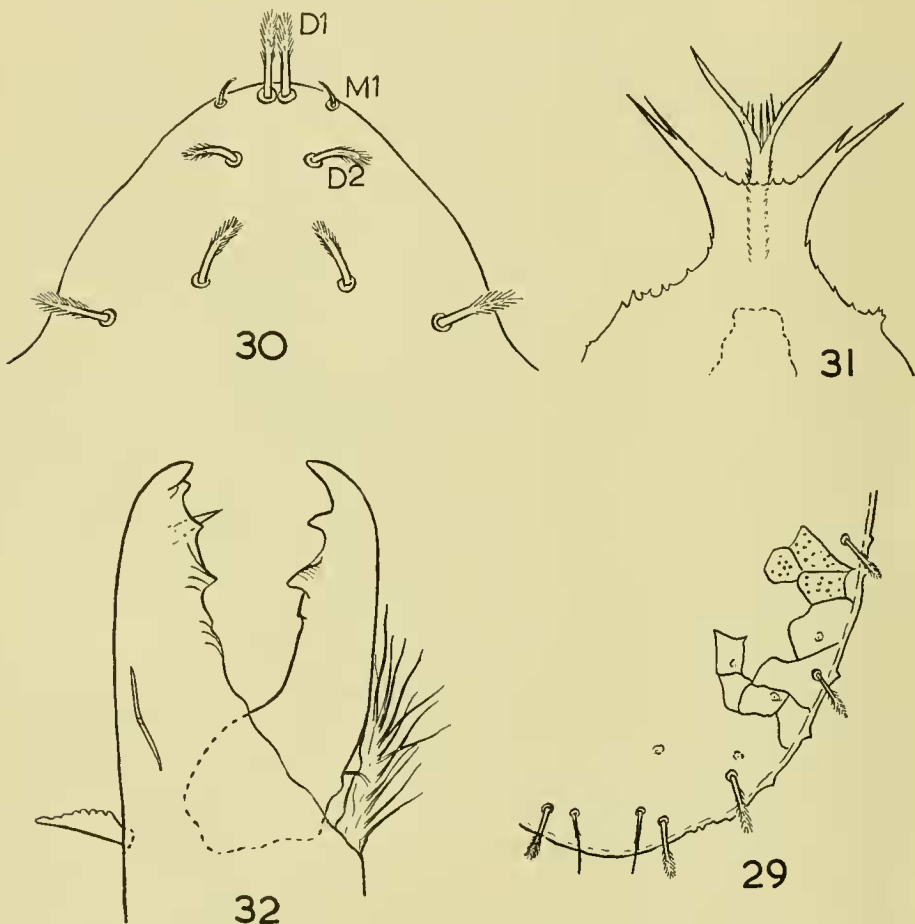
**MALE.** The chaetotaxy of the dorsal shield is basically the same as in the female. The sterniti-genital shield is provided with a polygonal network of ridges and strong punctures. The ventri-anal shield is also reticulated and punctured and measures about 298 $\mu$  in length and 310 $\mu$  in breadth. All the setae on this shield are simple.

The tectum is similar to that in the female. The spermatophoral process on the movable digit of the chelicera is short, being about one-half the length of the digit.

Femur, genu and tibia of leg II only are spurred.

DIMENSIONS. Male : 880–900 $\mu$  in length ; 500–540 $\mu$  in breadth. Female : 1,034–1,078 $\mu$  in length ; 570–640 $\mu$  in breadth.

HABITAT AND LOCALITY. In humus and moss from a number of localities in the British Isles. This species has also been recorded from Austria, Germany and the Netherlands.



FIGS. 29–32. *Macrocheles carinatus* (C. L. Koch), female. Fig. 29, postero-lateral margin of the dorsal shield. Fig. 30, anterior region of the dorsal shield. Fig. 31, tectum. Fig. 32, chelicera.

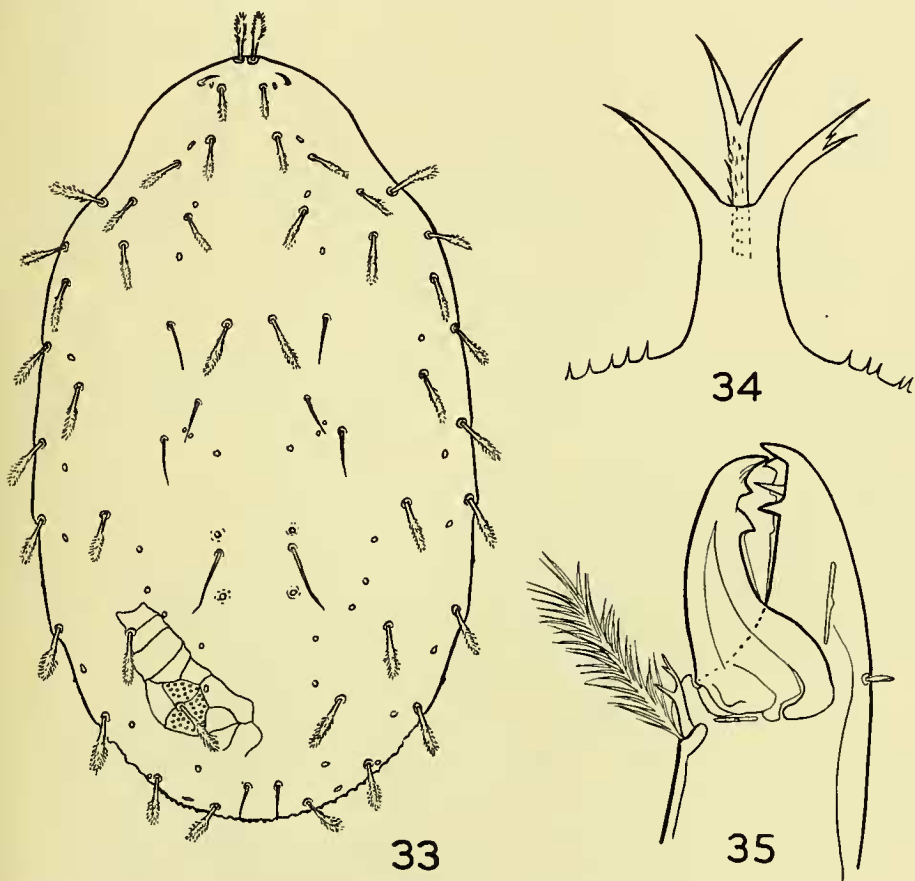
*Macrocheles penicilliger* Berl.

*Holostaspis penicilliger* Berlese, A. (1904). *Redia* 1: 264.

*Holostaspis penicilliger* Berlese, A. (1918). *Redia* 13: 146, 162.

*Macrocheles penicilliger*, Sellnick, M. (1940). *Göteborg. Vetensk. Samh. Handl.* (5) 6B: 82, figs.

FEMALE. The dorsal shield is strongly reticulated and punctured, and has its lateral margins serrated (Text-fig. 33). Vertical setae, approximately  $55\mu$  in length, are plumose in their distal two-thirds. Their bases are almost contiguous. Setae M1, M3, M4, D6–D8 are simple; remainder of dorsal setae plumose. Setae D8 are situated considerably anterior to the line connecting setae Mg10. Extra-marginal setae are plumose distally.



FIGS. 33–35. *Macrocheles penicilliger* (Berl.), female. Fig. 33, dorsal shield. Fig. 34, tectum. Fig. 35, chelicera.

The sternal shield is heavily ornamented with ridges and punctures (Pl. 2, fig. 10). The first pair of sternal setae are strongly plumose and the second and third pair slightly plumose distally. The metasternal setae are simple as are the pair of setae situated on the punctured genital shield. On the ventri-anal shield (approx.  $310 \times 330\mu$ ), the pre-anal and para-anal setae are simple and the post-anal seta plumose. The median pre-anal lies outside the line connecting the anterior and posterior pre-anal. There are no platelets between the ventri-anal and genital shields. The metapodals are strongly sclerotized and elongate.

The external posterior rostrals on the venter of the gnathosoma are about one-third the length of the internals. Ventral groove has five transverse rows of denticles. The lateral processes of the tectum are partially fused; distally these processes may or may not be divided (Text-fig. 34). The median process is deeply bifurcate. Both digits of the chelicerae are bidentate (Text-fig. 35). The pilus dentilis is short and thick at its base. The ventral seta is long and strongly pilose.

Leg I with tibia (approx.  $99\mu$ ) considerably shorter than the tarsus (approx.  $130\mu$ ).

MALE. Unknown.

DIMENSIONS. Female: length  $900-930\mu$ ; breadth  $525-550\mu$ .

HABITAT AND LOCALITY. This species has been found on *Trox scaber* (Linn.) in the nests of owls at Wytham, Oxford (Coll. C. E. Elton) and at Woodford, Essex (Coll. A. Hooper). Further records are from decaying leaves, Waterworks Valley, Jersey (Coll. G. Owen Evans), Italy (Berlese, 1904), Iceland (Sellnick, 1940) and Austria (Franz, 1954).

### *Macrocheles submotus* Falconer,

*Macrocheles cognatus* Falconer, W. (1923). *Naturalist, Lond.*: 152, fig. (nom. praeocc.).

*Macrocheles submotus* Falconer, W. (1924). *Naturalist, Lond.*: 363 (nom. nov. pro. *M. cognatus*).

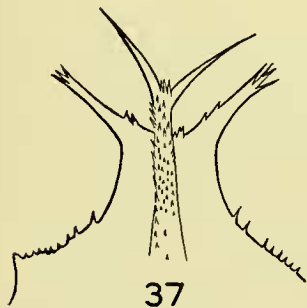
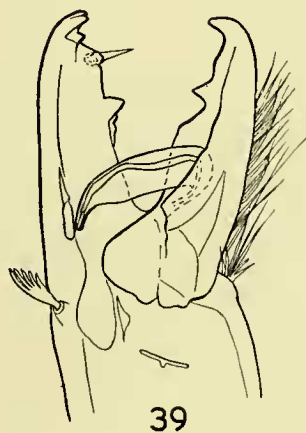
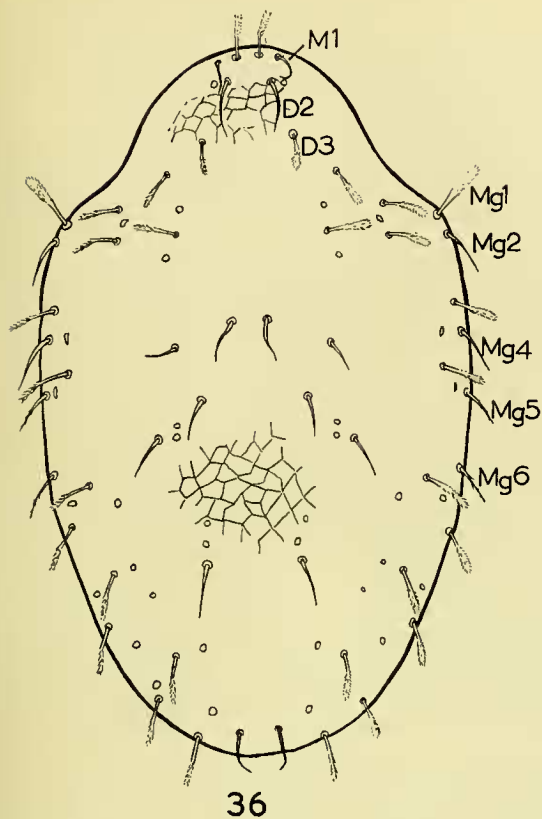
*Macrocheles (Nothrholaspis) occidentalis* Hull, J. E. (1925). *Ann. Mag. nat. Hist.* (9) 15: 213, fig. syn. nov.

? *Macrocheles (Nothrholaspis) gloriosus* Hull, J. E. (1925). *Ann. Mag. nat. Hist.* (9) 15: 214, fig. syn. nov.

FEMALE. Dorsal shield, strongly reticulated and punctured, is provided with twenty-eight pairs of setae and twenty-two pairs of pores. Its lateral margins are entire. Setae D1 plumose and situated about one diameter of their bases apart (Text-fig. 36). Setae M1, M4, D2, D5-D8, L1, Mg2 and Mg4 are simple, and Mg5 and Mg6 pilose. The remainder of the setae on the dorsal shield are distinctly plumose. The extra-marginal setae are simple or slightly pilose.

The tritosternum is normal with strongly pilose lacinae. The sternal shield, ornamented with strong ridges and large punctures, bears three pairs of simple, spine-like setae (Pl. 2, fig. 11). The metasternal and genital setae are also simple. Ventri-anal shield (approx.  $450 \times 430\mu$ ) is triangular in outline and ornamented with ridges and punctures. The pre-anal and para-anal setae are simple. The median pre-anal lies outside the line connecting the anterior and posterior pre-anals. Three pairs of platelets lie between the ventri-anal and genital shields. The interscutal membrane is closely striated. The peritreme and peritrematal shields are normal.

<sup>1</sup> This seta should be simple in Text-fig. 36.



FIGS. 36-39. *Macrocheles submotus* Falconer. Fig. 36, dorsal shield of female. Fig. 37, tectum of female. Fig. 38, chelicera of female. Fig. 39, chelicera of male.

The external posterior rostrals on the venter of the gnathosoma are about one-half the length of the internals. The ventral groove carries five transverse rows of denticles. The form of the tectum is shown in Text-fig. 37. Both digits of the chelicerae are massive (Text-fig. 38). The fixed digit has two strong and two weaker teeth; the movable digit is basically bi-dentate. The dorsal seta is comb-like.

Leg I (approx.  $1,100\mu$  in length) has the tibia ( $205\mu$ ) shorter than the tarsus ( $220\mu$ ). Legs II–IV measure respectively about  $1,150\mu$ ,  $1,078\mu$  and  $1,700\mu$ .

MALE. The chaetotaxy and ornamentation of the dorsal shield is essentially the same as in the female. Ventrally, the truncated sterniti-genital shield is coarsely punctured. The five pairs of setae on this compound shield are simple. The ventri-anal shield ( $350 \times 340\mu$ ) is reticulated and punctured; there are no platelets between the ventri-anal and genital shield. Both digits of the chelicerae are dentate as in Text-fig. 39. The spermatophoral process is considerably shorter than the length of the digit.

The femur, genu and tibia of leg II only are spurred.

DIMENSIONS. Male: length  $1,050$ – $1,100\mu$ ; breadth  $620$ – $630\mu$ . Female:  $1,390$ – $1,450\mu$ ; breadth  $780$ – $820\mu$ .

HABITAT AND LOCALITY. This is one of the commonest, and most widely distributed Macrochelid found in litter and humus under deciduous and coniferous trees in Britain.

The above description of *submotus* is based on specimens compared with the type in the Falconer Collection at the Liverpool Museum. This species has also appeared under the name of *Macrocheles tridentinus* (Can.) in British and possibly other European faunal lists. The original description of *tridentinus* was based on the male only and both description and drawings are insufficient for the certain identity of the species. Canestrini gives the length of the male of *tridentinus* as  $860\mu$ .

### *Macrocheles tardus* (C. L. Koch)

*Gamasus tardus* Koch, C. L. 1841. *Deutsch. Crust. Myr. Arach.* fasc. 39, t. 14.

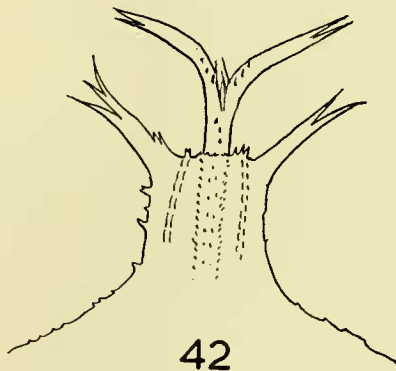
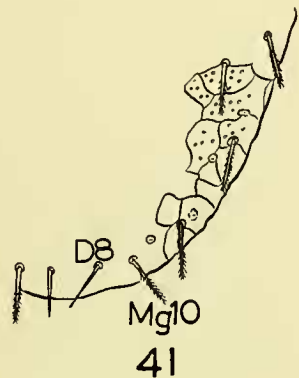
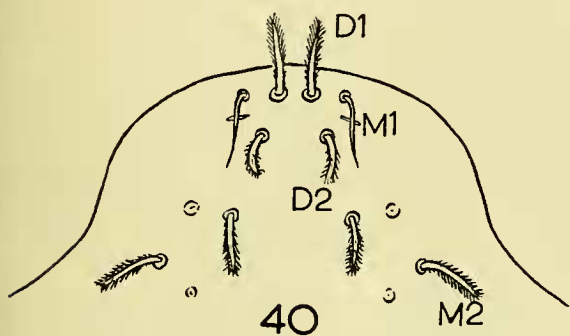
*Nothrholaspis tardus*, Sellnick, M. 1931. *S.B. Akad. Wiss. Wien.* 140: 765, figs.

FEMALE. Dorsal shield, strongly reticulated and punctured, is provided with twenty-eight pairs of setae and twenty-two pairs of pores. The vertical setae (D1) are plumose and well separated, setae M1 are long, simple and extend beyond the bases of D2 by about one-half their length (Text-fig. 40). Setae M3, M4, D6 and D8 are simple, D7 are finely pectinated whilst the remainder of the setae of the dorsal shield are strongly plumose. The marginal setae (Mg) are situated a short distance from the lateral margin of the shield (Text-fig. 41). The anterior extra-marginal setae are pectinate and the posterior extra-marginals plumose.

The tritosternum is normal with strongly pilose lacinae. The sternal shield is ornamented with a polygonal network of ridges and numerous punctures (Pl. 2, fig. 12). All the sternal setae are simple. The metasternal shields are small and the setae plumose. The strongly punctured genital shield is convex posteriorly and bears a pair of simple setae. The ventri-anal shield, about as broad as long ( $330 \times 300\mu$ ) is

reticulated and punctured. The anterior and posterior pre-anals are simple but the median pre-anal may be simple or pectinate. The para-anals are long and simple and the post-anal seta short and plumose. The region between the genital and ventri-anal shields is usually provided with three pairs of platelets. This number may be reduced in some specimens. The metapodal shields are small. The peritreme and peritrematal shield are normal. The interscutal membrane is coarsely striated, the striae being provided with triangular processes at intervals along their length.

Ventrally, the gnathosoma has the normal four pairs of setae of which the external posterior rostrals are about one-half the length of the internals. The ventral groove



FIGS. 40-43. *Macrocheles tardus* (C. L. Koch), female. Fig. 40, anterior region of the dorsal shield. Fig. 41, postero-lateral margin of dorsal shield. Fig. 42, tectum. Fig. 43, chelicera.

has five rows of denticles. The lateral processes of the tectum are partially fused (Text-fig. 42); the distal end of these processes being bi- or trifurcate. The stout median process is divided; each arm being entire or divided distally. The fixed digit of the chelicera is provided with two strong teeth and between them two or three weaker teeth (Text-fig. 43). The pilus dentilis is long and stout. The movable digit has two recurved teeth only. The dorsal seta is large and comb-like.

Leg I (approximately  $1,020\mu$  in length) bears plumose setae on the femur, genu and tibia. The tibia ( $165-175\mu$ ) is shorter than the tarsus ( $200-215\mu$ ). Leg II ( $880\mu$ ) has plumose setae on the trochanter and tarsus as have leg III ( $820\mu$ ) and leg IV ( $1,485\mu$ ).

MALE. The chaetotaxy and ornamentation of the dorsal shield is essentially the same as in the female. The sterniti-genital shield, truncated posteriorly, is heavily reticulated and punctured. The five pairs of setae on the compound shield are simple. The ventri-anal shield ( $330 \times 350\mu$ ) is also reticulated and punctured. The pre-anal and para-anal setae are usually simple, but may be pectinate. The post-anal seta is strongly pilose. The chelicerae are basically the same as in *M. cognatus*, differing only in the position of the large proximal tooth on the fixed digit. The spermatophoral process is considerably shorter than the length of the movable digit.

The femur, genu and tibia of leg II are the only segments which are spurred.

DIMENSIONS. Male:  $1,030-1,100\mu$  in length;  $627-700\mu$  in breadth. Female  $1,215-1,290\mu$  in length;  $730-800\mu$  in breadth.

HABITAT AND LOCALITY. In vegetable debris near Rydal Water, Westmorland and in decaying leaves, Waterworks Valley, Jersey. This species has also been recorded from a number of other localities in Europe (Franz, 1954).

### *Macrocheles decoloratus* (C. L. Koch)

*Gamasus decoloratus* Koch, C. L. (1893). *Deutsch. Crust. Myr. Arach.* fasc. 25, t. 14.

*Macrocheles decoloratus*, Oudemans, A. C. (1913). *Ent. Ber. Amst.* 4: 5.

*Macrocheles decoloratus*, Oudemans, A. C. (1914). *Arch. Naturgesch.* 79A Hft. 8: 173.

FEMALE. Dorsal shield, weakly reticulated but strongly punctured, bears twenty-eight pairs of setae and twenty-two pairs of pores (Text-fig. 44). The vertical setae (D1) are well separated and strongly plumose. The remainder of the setae on the dorsal shield are also plumose. A characteristic feature of the chaetotaxy is the relative length of setae Mg9 and 10. The latter is approximately equal in length to D8, but only about one-half the length of Mg9. The extra-marginal setae are plumose.

The tritosternum is normal. The sternal shield ( $195\mu$  long  $\times$   $220\mu$  wide) is ornamented with a faint reticulate pattern and large punctures (Pl. 3, fig. 13). The punctate areas are usually conspicuous. The three pairs of sternal setae and the metasternals are long and simple or slightly pectinate. The genital shield is strongly punctured and has a network of punctate lines in its anterior half. The genital setae usually are simple. The ventri-anal shield ( $286-298\mu$  long  $\times$   $250-286\mu$  wide) is provided with a network of punctate lines. The lateral regions of the shield are densely punctured. The pre-anal and para-anal setae are long and simple. The post-anal seta is shorter and plumose. There are no platelets between the genital and ventri-anal shield. The

metapodals are small and irregular in outline. The peritreme and peritrematal shields are normal.

Ventrally, the gnathosoma carries the normal four pairs of setae. The external posterior rostrals are about one-third the length of the internals. The capitular

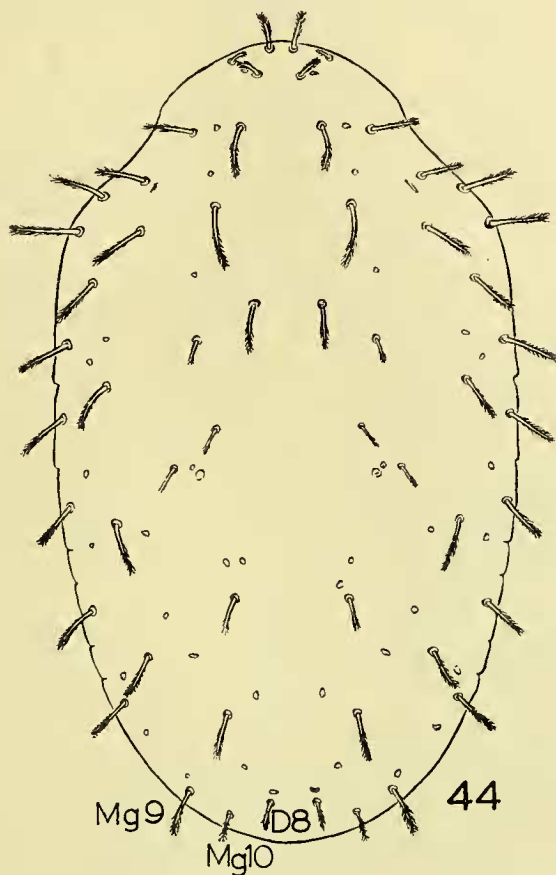


FIG. 44. *Macrocheles decoloratus* (C. L. Koch), female. Dorsal shield.

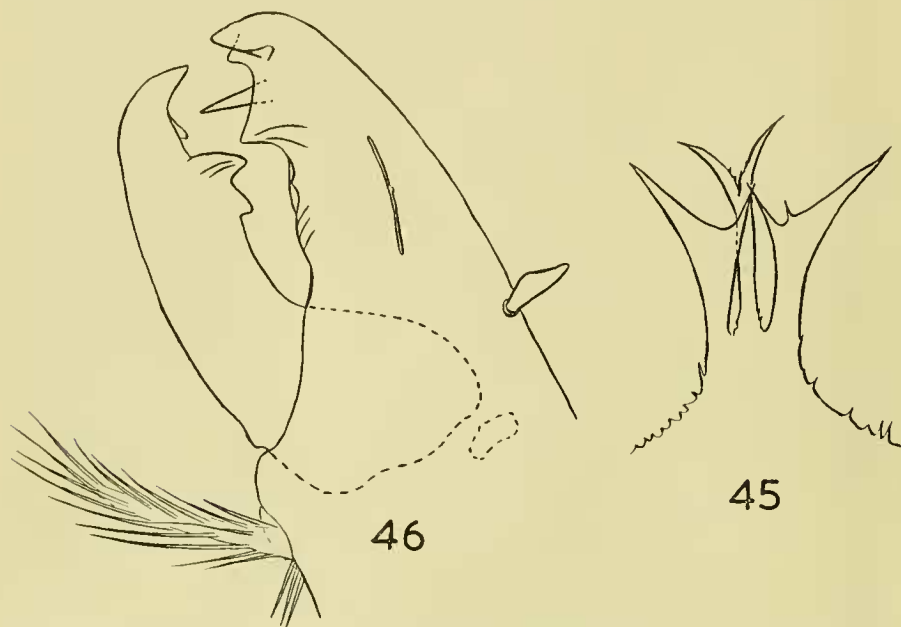
groove is provided with five transverse rows of denticles. The tectum (Text-fig. 45) has the three anterior processes separate. The movable digit of the chelicera is tridentate and the fixed bi- or tridentate (Text-fig. 46). The dorsal seta is spatulate.

Leg I (approx.  $670\mu$ ) with plumose setae on femur, genu and tibia. Tarsus I ( $132-140\mu$ ) longer than tibia I ( $121\mu$ ). Leg II ( $680\mu$ ). Leg III ( $638\mu$ ) and Leg IV ( $990\mu$ ) with some plumose setae on trochanter and tarsus.

MALE. Unknown.

**DIMENSIONS.** Length  $850\text{--}880\mu$ ; breadth  $510\text{--}520\mu$ .

**HABITAT AND LOCALITY.** In cow dung, nr. Canterbury, Kent (Coll. E. Warren, 1942). This species has also been recorded from Austria, Germany and the Netherlands.



FIGS. 45—46. *Macrocheles decoloratus* (C. L. Koch), female. Fig. 45, tectum.  
Fig. 46, chelicera.

### *Macrocheles matrius* (Hull).

*Nothrolaspis matrius* Hull, J. E. (1925). *Ann. Mag. nat. Hist.* (9) **15**: 212.

*Macrocheles subbadius* var. *robustus*, Sellnick, M. (1940). *Göteborg. Vetensk. Samh. Handl.* (5) **6B**: 86, figs.

*Macrocheles carinatus*, Hughes, A. M. (1948). *Mites associated with stored food products*. H.M.S.O.: 126, figs.

**FEMALE.** Superficially, the chaetotaxy of the dorsal shield in this species resembles that in *M. decoloratus*. The chief difference between the species lies in the relative lengths of setae Mg9 and Mg10 which in the present species are approximately equal in length (Text-fig. 47). The extra-marginal setae are slightly plumose.

The sternal shield ( $187\mu$  long  $\times$   $220\mu$  wide) has well developed lines and a few punctures (Pl. 3, fig. 14). The punctate areas are considerably larger and more strongly developed than in *M. decoloratus*. The sternal and metasternal setae are simple or slightly pectinate. The genital shield is ornamented with punctate lines and large punctures. The genital setae are plumose distally. The ventri-anal shield

( $340\mu \times 375\mu$  wide) is characteristically ornamented. The pre-anal and para-anal setae are simple. The post-anal seta is short and plumose distally. Metapodals are elongate and weakly sclerotized.

The gnathosoma is essentially the same as in *decoloratus* except for the structure of

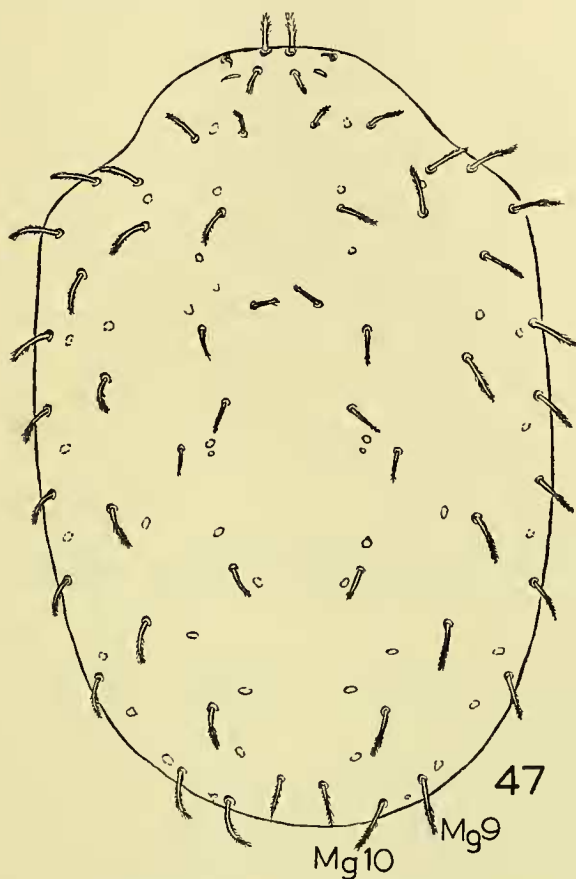


FIG. 47. *Macrocheles matrius* Hull, female. Dorsal shield.

the tectum; in *matrius* the external margin of the lateral processes are strongly serrulate (Text-fig. 48).

MALE. This sex is adequately described and figured by Hughes (1948).

DIMENSIONS. Male: length  $680-720\mu$ ; breadth not stated by Hughes (1948). Female: length  $890-910\mu$ ; breadth  $540-565\mu$ .

HABITAT AND LOCALITY. Hull (1925) states that the species is "not uncommon in north of England. Abundant in poultry manure, West Allendale". We have

examined specimens from the nest of *Riparia riparia* at Tirley, Gloucestershire (Coll. R. S. George) and from poultry manure at Houghton, Huntingdonshire (Coll. C. Horton Smith). Hughes (1948) records it under the name *M. carinatus* from floor debris and sievings of grain.



FIG. 48. *Macrocheles matrius* Hull, female. Tectum.

*M. matrius* is undoubtedly conspecific with *Macrocheles subbadius* var. *robustus* (Berl.) Sellnick (1940). If the species described and figured by Sellnick is the same as *robustus*, there is some doubt concerning this, then *matrius* must be considered a synonym.

### *Macrocheles plumiventris* Hull

*Holostaspis marginatus* Berlese, A. (1889). *Acari, Myriopoda et Scorpiones, etc.*, fasc. 52, No. 4 and 5, figs.

? *Macrocheles gladiator* Hull, J. E. (1918). *Trans. Nat. Soc. Northumb.*, n.s. 5: 71, figs.

? *Macrocheles plumipes* Hull, J. E. (1918). *tom. cit.*: 72, fig.

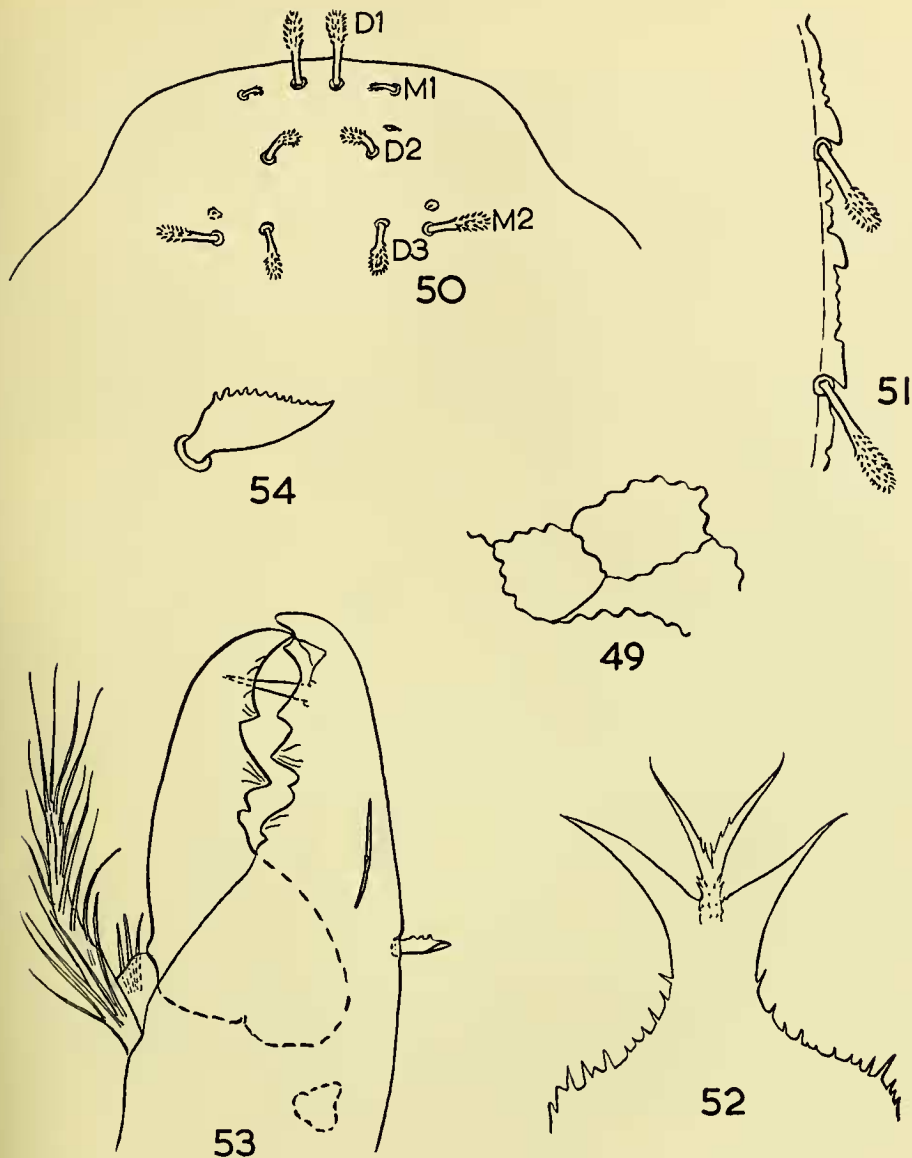
*Macrocheles* (*Monoplites*) *oudemansii* Hull, J. E. (1925). *Ann. Mag. nat. Hist.* (9), 15: 215 (in part).

*Macrocheles plumiventris* Hull, J. E. (1925). *Ann. Mag. nat. Hist.* (9), 15: 216, figs.

*Nothrholaspis finicola* Sellnick, M. (1931). *S.B. Akad. Wiss. Wien* 140: 765, fig. *syn. nov.*

**FEMALE.** The dorsal shield is strongly reticulated, especially in its posterior two-thirds. The lines of the mesh-work are distinctly crenulated (Text-fig. 49). The vertical setae (D1) which are well separated, and setae D2–D4, M2, series L and series Mg. are strongly plumose in their distal half (Text-fig. 50). Setae M1 are short and relatively weakly plumose; setae D6–D8 and Mg2–3 are considerably finer and less plumose than the L and the remainder of the Mg. series. The marginal setae are situated on the serrated lateral margin of the dorsal shield (Text-fig. 51). The extra-marginal setae are plumose.

The tritosternum is normal. All the ventral shields are strongly reticulated and



FIGS. 49–54. *Macrocheles plumiventris* Hull, female. Fig. 49, ornamentation of the dorsal shield. Fig. 50, anterior region of the dorsal shield. Fig. 51, lateral margin of the dorsal shield. Fig. 52, tectum. Fig. 53, chelicera. Fig. 54, dorsal seta on chelicera

punctured (Pl. 3, fig. 15). The sternal shield bears three pairs of sternal setae of which  $h_1$  is strongly plumose and  $h_2$ –3 smooth and blunt. The metasternal shields are free and the setae plumose. The genital shield is provided with accessory sclerites and the genital setae are plumose. The ventri-anal shield is considerably broader than long ( $370$ – $460\mu \times 490$ – $610\mu$ ) and characteristically shaped. The three pairs of pre-anal setae are plumose, the para-anal setae fine and slightly pilose, and the post-anal seta short and strongly plumose. The metapodal shields are well developed. The peritreme and peritrematal shield are normal for the genus.

Ventrally, the gnathosoma bears four pairs of setae. The external posterior rostrals are more than one-half the length of the internal posterior rostrals. The ventral groove is provided with seven rows of denticles. The pedipalps are normal. The tectum has its lateral processes partially fused. The apex of these processes may be entire or bifurcated (Text-fig. 52). The median process is strongly bifid distally. The fixed digit of the chelicera has five teeth of which the larger are ridged (Text-fig. 53). The movable digit is provided with three teeth, the proximal being the smallest. The dorsal seta has a denticulate margin (Text-fig. 54). The ventral setae are long and strongly pilose.

Leg I, about  $1,200\mu$  in length, has plumose setae on the femur, genu and tibia. Trochanter I bears a short conical spur internally. Tibia I measures  $220$ – $242\mu$  and Tarsus I  $210$ – $220\mu$ . Leg II is stout, approximately  $1,100\mu$  in length and richly provided with plumose setae as are leg III (approx.  $1,030\mu$ ) and Leg IV (approx.  $1,650\mu$ ). The pulvilli and claws of Legs II–III are well developed.

MALE. The ornamentation and chaetotaxy of the dorsal shield is basically the same as in the female. The venter is covered by a reticulated holoventral shield. The fixed digit of the chelicera is provided with four teeth in its distal half. The movable digit, in the specimen under study, has a single tooth. Berlese (1889) shows four teeth on this digit! The spermatophoral process is longer than the movable digit and is pointed distally. The trochanter, femur, genu, tibia and tarsus of Leg II are provided with spurs, also genu III, and trochanter and femur IV.

DIMENSIONS. Male:  $913\mu$  in length and  $605\mu$  in breadth (a single specimen in the Michael Collection). Female:  $1,150$ – $1,480\mu$  in length and  $750$ – $935\mu$  in breadth.

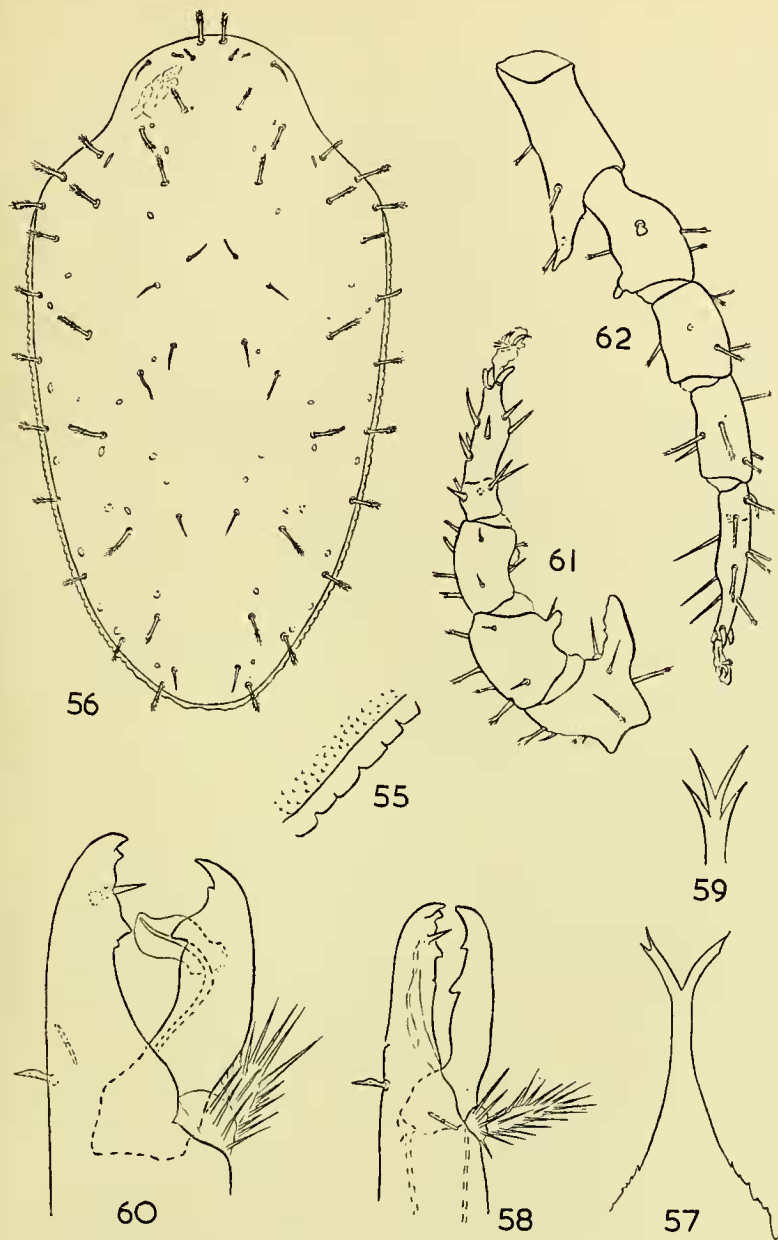
HABITAT AND LOCALITY. In manure and compost heaps. Common and widely distributed in Europe.

Sellnick (1931) drew attention to the fact that *Holostaspis marginatus* Berl. (1889) was not *Acarus marginatus* Hermann (1804) and proposed the name *Nothrholaspis fimicola* for Berlese's species. Hull (1925) had, however, already described this species under *Macrocheles plumiventris*. It is also possible that Hull's *Macrocheles gladiator* and *plumipes* are referable to this species, but the original descriptions and figures are wholly inadequate for their certain identity.

### *Macrocheles superbus* Hull

*Macrocheles superbus* Hull, J. E. (1918). *Trans. Nat. Hist. Soc. Northumb.*, n.s. 5: 71, figs.

FEMALE. Dorsal shield minutely punctured and with a faint reticulated pattern in its posterior half. The lateral margin of the shield is evenly serrated (Text-fig. 55).



FIGS. 55-62. *Macrocheles superbus* Hull. Fig. 55, lateral margin of dorsal shield. Fig. 56, dorsal shield of female. Fig. 57, tectum of female. Fig. 58, chelicera of female. Fig. 59, distal end of tectum of male. Fig. 60, chelicera of male. Fig. 61, leg II of male. Fig. 62, leg IV of male.

The vertical setae (D1) are stout, plumose and widely separated (Text-fig. 56). Setae D4–D8, M3 and M4 are simple and minutely spiculate distally. The remainder of the dorsal setae are stout and plumose. The extra-marginal setae are plumose distally.

The tritosternum is normal with the lacinae strongly pilose. The sternal shield is ornamented with a network of ridges and punctures (Pl. 3, fig. 16). The punctate areas are distinct. The first pair of sternal setae (h1) are strongly plumose whereas h2 and h3 are simple and blunt apically. The metasternal setae are similar in form to setae h2 and h3. The genital shield, strongly punctured, is provided with accessory sclerites and a pair of rod-like setae which are spiculate dorsally. The ventri-anal shield (approximately  $580 \times 460\mu$ ) is strongly reticulated and punctured. The anterior pre-anal setae are simple and the median and posterior setae plumose. The para-anals are simple and the post-anal plumose. A pair of well-sclerotized platelets lie between the genital and ventri-anal shields. The metapodal shields are well developed. The peritreme and peritrematal shield are normal.

The four pairs of ventral setae on the gnathosoma are simple with the external posterior rostrals about one-eighth the length of the internals. The former lie well in advance of the latter. The ventral groove is provided with five rows of denticles. The tectum consists of a single process, bifurcate distally (Text-fig. 57). The chelicerae are strongly chelate-dentate with the fixed digit bearing two well-developed teeth and a strong *pilus dentilis* (Text-fig. 58). The movable digit is also bidentate.

Leg I (approx.  $480\mu$ ) with the tibia ( $230\text{--}240\mu$ ) considerably shorter than the tarsus ( $297\text{--}320\mu$ ).

MALE. The chaetotaxy and ornamentation of the dorsal shield is essentially the same as in the female except for a characteristic densely punctured area surrounding the base of setae L6. In the majority of the males examined the dorsal shield was strongly attenuated in the posterior third.

The sterniti-genital shield is poorly ornamented with a network of ridges and punctures and its posterior margin is slightly concave. The five pairs of setae on the shield are all plumose distally. The ventri-anal shield (approximately  $560 \times 350\mu$ ) is provided with a polygonal network of ridges and numerous punctations. The pre-anal setae and the post-anal seta are plumose in their distal half. The para-anals are simple. The interscutal membrane between the sterniti-genital and ventri-anal shield is without sclerotized platelets. The metapodal shields are well developed.

The structure of the venter of the gnathosoma is basically the same as in the female. The tectum may be bifurcate or more extensively divided distally (Text-fig. 59). The fixed digit of the chelicera is tridentate and the movable bidentate. The spermatophoral process is about one-third the length of the movable digit (Text-fig. 60).

Femur, genu and tibia of leg II (Text-fig. 61) and the trochanter and femur of leg IV (Text-fig. 62) are spurred.

DIMENSIONS. Male:  $1,420\text{--}1,520\mu$  in length,  $850\text{--}900\mu$  in breadth. Female:  $1,450\text{--}1,650\mu$  in length,  $790\text{--}900\mu$  in breadth.

HABITAT AND DISTRIBUTION. Common in wrack and tidal debris above high-water mark on the seashore. Also recorded from salt marshes (Falconer, 1923). Widely distributed in Britain.

## SPECIES INCERTAE SEDIS

***Macrocheles (Nothrholaspis) pannosus* Hull**

Hull, J. E. (1925). *Ann. Mag. nat. Hist.* (9), **15**: 211, fig.

It is possible that this species is a small form of *M. plumiventris*.

DIMENSIONS. Female:  $900\mu$  in length.

HABITAT AND LOCALITY. "In manure, West Allendale."

***Macrocheles (Nothrholaspis) nemoralis* Hull**

Hull, J. E. (1925). *Ann. Mag. nat. Hist.* (9), **15**: 213, fig.

This species is possibly a synonym of *M. penicilliger*.

DIMENSIONS. Female:  $810\mu$  in length,  $500\mu$  in breadth.

HABITAT AND LOCALITY. "West Allendale; habitat unknown."

***Macrocheles (Nothrholaspis) parmulatus* Hull**

Hull, J. E. (1925). *Ann. Mag. nat. Hist.* (9), **15**: 214, fig.

DIMENSIONS. Female:  $1,200\mu$  in length.

HABITAT AND LOCALITY. "West Allendale; habitat unknown."

***Macrocheles (Monoplites) palustris* Hull**

Hull, J. E. (1925). *Ann. Mag. nat. Hist.* (9), **15**: 216, fig.

DIMENSIONS. Male:  $1,100\mu$ ; female,  $1,200\mu$ .

HABITAT AND LOCALITY. "In sphagnum on the moors, West Allendale."

***Macrocheles (Monoplites) tardior* Hull**

Hull, J. E. (1925). *Ann. Mag. nat. Hist.* (9), **15**: 216, fig.

DIMENSIONS. Female:  $1,000\mu$  in length.

HABITAT AND LOCALITY. "Oxfordshire (R. S. Bagnall). Habitat not stated."

Genus **GEHOLASPIS** Berl. s. lat.

*Geholaspis* Berlese, A. (1918). *Redia*, **13**: 145.

This genus has been revised by Valle (1953) and may be defined as follows:

Dorsal shield with twenty-eight pairs of setae and twenty-two pairs of "pores".  
Sternal shield with three pairs of setae; metasternal shields free or fused with the endopodal shields. Ventri-anal shield in the female with *five* pairs of pre-anal setae.  
Chelicerae normal length with a few teeth or conspicuously elongate and multi-

dentate Tectum with median process only. Other characters as in *Macrocheles* Latr.

TYPE : *Gamasus longispinosus* Kramer, 1876.

Valle (loc. cit.) subdivided the genus into three subgenera of which the following two are represented in the British fauna :

1. Seta M1 long and simple, and extending beyond the bases of D2 by more than half their length (fig. 63). Ratio of the length of the dorsal shield to the length of the movable digit of the chelicera varies between 6·8 and 10·4 ; movable digit with less than 5 teeth . . . . . *Geholaspis* s. str.
- Seta M1 short, simple or plumose, and not or scarcely extending beyond the bases of seta D2 (fig. 66). Ratio of the length of the dorsal shield to the length of the movable digit of the chelicera varies between 3·7 and 4·5 ; movable digit with more than five teeth . . . . . *Longicheles* Valle.

The subgenus *Geholaspis* is represented in Britain by the type species only, and *Longicheles* by two species, namely, *G. (L.) mandibularis* (Berl.) and *G. (L.) longulus* (Berl.).

Subgenus **GEHOLASPIS** Berl. s. str.

***Geholaspis (Geholaspis) longispinosus* (Kramer).**

*Gamasus longispinosus* Kramer, P. (1876). *Arch. Naturgesch.* **42** : 100, fig.

*Holostaspis longispinosus*, Berlese, A. (1887). *Acari, Myriapoda et Scorpiones, etc.*, fasc. **44**, No. 1, figs.

? *Macrocheles castaneus* Hull, J. E. (1925). *Ann. Mag. nat. Hist.* (9), **15** : 212.

FEMALE. The dorsal shield is minutely punctured all over and reticulated in its posterior half. It carries twenty-eight pairs of setae and twenty-two pairs of " pores " distributed as in Text-fig. 63. Setae D1 are strongly plumose ; D2, D5–D8, M1, M5 and M6, and L1 are simple. The remainder of the dorsal setae are pilose. The extra-marginal setae are similar in structure to the marginal series.

The tritosternum is normal with the lacinae pilose. The sternal shield is ornamented with a network of ridges and punctures (Pl. 4, fig. 17). The three pairs of sternal setae and the metasternals are simple. The genital shield is broad and strongly sculptured. The genital setae are simple and the accessory sclerites well-developed. The large ventri-anal shield (440–440 $\mu$  in length and 465–510 $\mu$  in breadth) is broader than long and bears five pairs of pre-anal setae in addition to the three setae normally associated with the anus. The relative lengths of these setae are shown in Text-fig. 4. The surface of the shield is evenly reticulated. The metapodal shields are small and weakly sclerotized. The peritrematal shield is free in its posterior half.

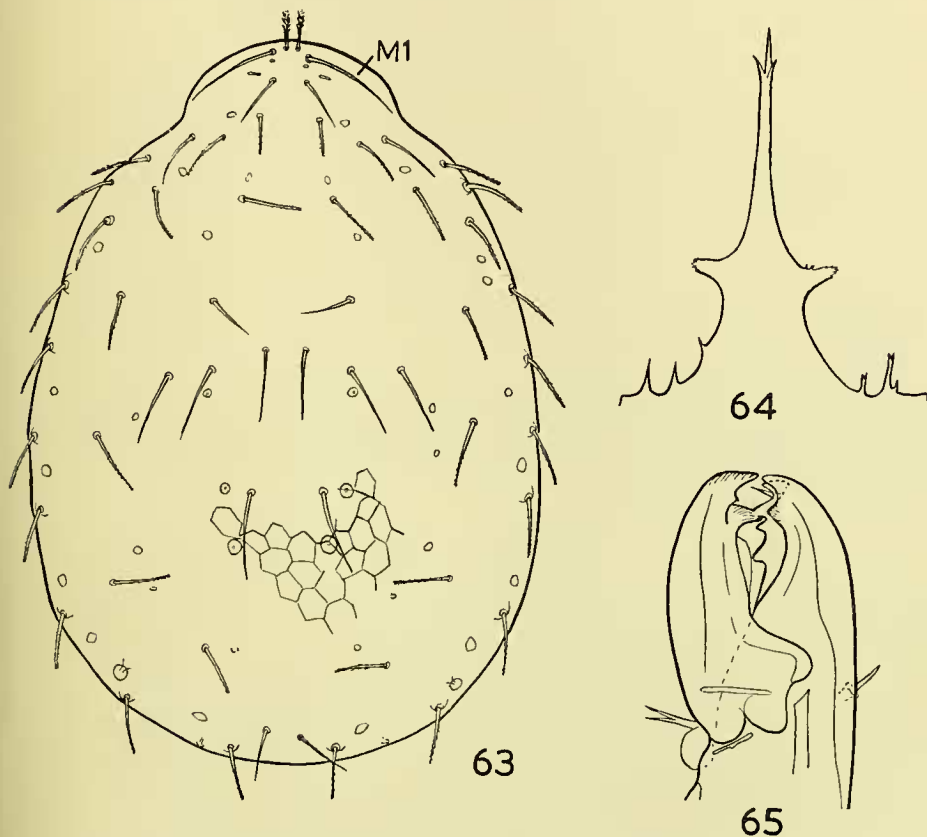
Ventrally, the gnathosoma bears the normal four pairs of setae. The external posterior rostrals lie well in advance of the internals. The ventral groove is provided with six transverse rows of denticles. The corniculi are long and slender. The tectum comprises a median process arising from a denticulate base (Text-fig. 64). The process is provided with shoulder-like projections of varying size and shape about a third of the distance from its base ; distally it is divided into two or three pointed branches.

The chelicerae are strongly developed and dentate; the dentition of the digits is shown in Text-fig. 65. The ventral setae, omitted from the figure, are well developed.

Tibia I (approx.  $84\mu$ ) is considerably shorter than tarsus I (approx.  $133\mu$ ).

MALE. This sex does not appear to have been described.

DIMENSIONS. Length,  $870-970\mu$ ; breadth  $590-710\mu$ .



FIGS. 63-65. *Geholaspis (Geholaspis) longispinosus* (Kramer), female. Fig. 63, dorsal shield. Fig. 64, tectum. Fig. 65, chelicera.

HABITAT AND LOCALITY. This species is widely distributed in Europe (Valle, 1953) and relatively common in moss, litter and humus. It has been recorded from North Wales by Hull (1918) and from Ireland by Halbert (1915). The writers have examined specimens from a number of localities in England, Wales and Scotland.

The figures of the dorsal and ventri-anal shields of *Geholaspis longispinosus* (Kramer) given by Valle (1953, figs. I and V (2)) do not appear to refer to this species

but to *Geholaspis forolivensis* Lombardini, 1943, which he considers to be a subspecies of *longispinosus*. In *forolivensis* the lateral and marginal series of dorsal setae are strongly plumose as in *mandibularis*, and the shape of the ventri-anal shield and the relative lengths of the pre-anal setae do not conform with those in *longispinosus*.

### Subgenus *LONGICHELES* Valle

The two British species of this subgenus may be separated as follows :

1. Setae M<sub>1</sub> simple ; a simple seta situated between plumose setae L<sub>3</sub> and L<sub>4</sub> ; dorsal shield less than 650 $\mu$  in length . . . . . *G.(L.) longulus* (Berl.)
- Setae M<sub>1</sub> strongly plumose ; without simple seta between plumose setae L<sub>3</sub> and L<sub>4</sub> (Text-fig. 66) ; dorsal shield about 750 $\mu$  in length . . . . . *G.(L.) mandibularis* (Berl.)

### *Geholaspis (Longicheles) longulus* (Berl.)

*Holostaspis longulus* Berlese, A. (1887). *Acari, Myriapoda et Scorpiones, etc.*, fasc. 43, no. 9, figs.

*Geholaspis (Longicheles) longulus*, Valle, A. (1953). *Redia* 38 : 351, figs.

The key characters given above are based on the description and figures of this species by Valle (1953). The writers have not examined this species, which is recorded by Halbert (1915) from a number of localities in Ireland and by Hull (1918) from Ninebanks, Northumberland.

### *Geholaspis (Longicheles) mandibularis* (Berl.)

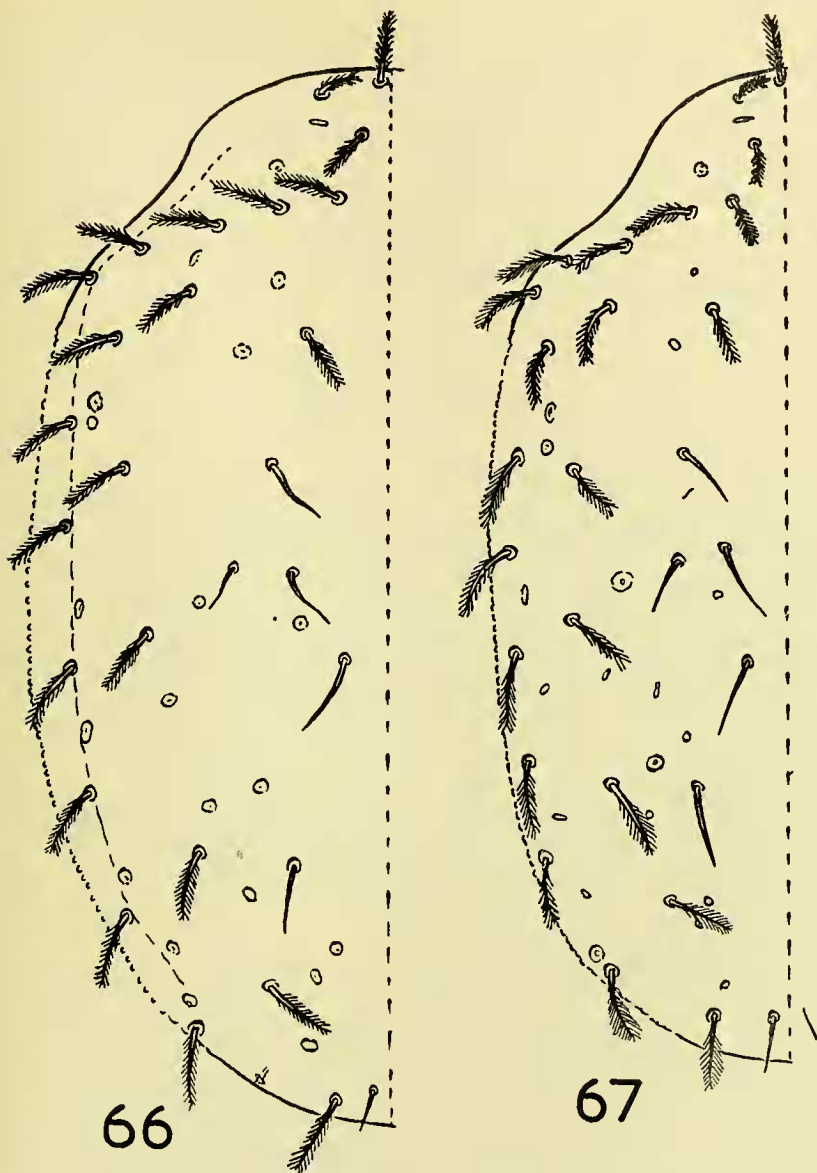
*Holostaspis mandibularis* Berlese, A. (1904). *Redia*, 1 : 263.

? *Macrocheles minimus* Hull, J. E. (1918). *Trans. Nat. Hist. Soc. Northumb.* n.s. 5 : 73, fig.

*Geholaspis (Longicheles) mandibularis*, Valle, A. (1953). *Redia* 38 : 344, figs.

**FEMALE** The dorsal shield is densely covered with minute tubercles and bears twenty-eight pairs of setae, of which twenty-two pairs are strongly plumose. The distribution of setae in the posterior half of the shield shows some variation in the material examined. The normal chaetotactic pattern is shown in Text-fig. 66 and a variant in Text-fig. 67. The lateral margins of the shield are conspicuously serrated. The vertical setae lie in close proximity to each other ; setae M<sub>1</sub> are strongly plumose. The extra-marginal setae are plumose and increase in length towards the posterior end of the idiosoma.

The lacinae of the tritosternum are long and pilose. The sternal shield is ornamented with strong ridges and tubercles ; the three pairs of sternal setae are simple. The elongate metasternals each carry a simple seta. The genital shield is ornamented with punctate lines ; the genital setae are simple. The ventri-anal shield is evenly reticulated and tuberculated, and is provided with five pairs of pre-anal setae of which the external posteriors are pilose. The shape of the shield and the length of the setae show considerable variation in the specimens examined (cf. Text-figs.



FIGS. 66-67. Variation in the chaetotaxy of the dorsal shield of *Geholaspis* (*Longicheles*) *mandibularis* (Berl.), female.

68–70). The metapodals are elongate and weakly sclerotized. The posterior half of the peritrematal shield is free.

The external posterior rostrals lie well in advance of the internals and the ventral groove is provided with five transverse rows of denticles. The corniculi are long and slender and extend beyond the middle of the palp femur. The form of the tectum is shown in Text-fig. 71. The chelicerae are very long and strongly toothed (Text-fig. 72).

Leg I (approx.  $600\mu$  in length) with the tibia (approx.  $100\mu$ .) shorter than the tarsus (approx.  $130\mu$ ).

DIMENSIONS. Female: length,  $750\text{--}800\mu$ ; breadth,  $480\text{--}500\mu$ .

HABITAT AND LOCALITY. In litter, moss and compost. Widely distributed in Europe (Franz, 1954).

### Genus *MACRHOLASPI* Oudemans.

*Macrholaspis* Oudemans, A. C. (1931). *Ent. Ber.* 8, No. 180: 272.

This genus was proposed by Oudemans (1931) for *Gamasus opacus* C. L. Koch and was characterized by the female having only two pairs of setae on the ventri-anal shield ("Ventrianaalschild mit 2 paar borstels"). According to Oudemans one of these two pairs of setae would be the para-anals and the other the pre-anals. Recently, the writers have examined a preparation and an unpublished drawing of *opacus* from the Oudemans Collection at Leiden, and found that the ventri-anal shield of the female, the only sex known, has two pairs of pre-anal setae and not one pair as Oudemans has stated. Further, *Nothrholaspis aciculatus* Berl., a common European species, was found to be synonymous with *Macrholaspis opacus* (Koch) Oudemans, 1931.

The following is an emended definition of the genus *Macrholaspis*:

Dorsal shield strongly attenuated posteriorly and bearing twenty-nine pairs<sup>1</sup> of plumose setae. Lateral margins of the shield markedly serrated. Sternal shield with three pairs of setae; metasternals free. Genital shield with accessory sclerites and a pair of genital setae. Ventri-anal shield with *two* pairs of pre-anal setae. Other characters as in *Macrocheles*.

TYPE. *Gamasus opacus* C. L. Koch, 1839.

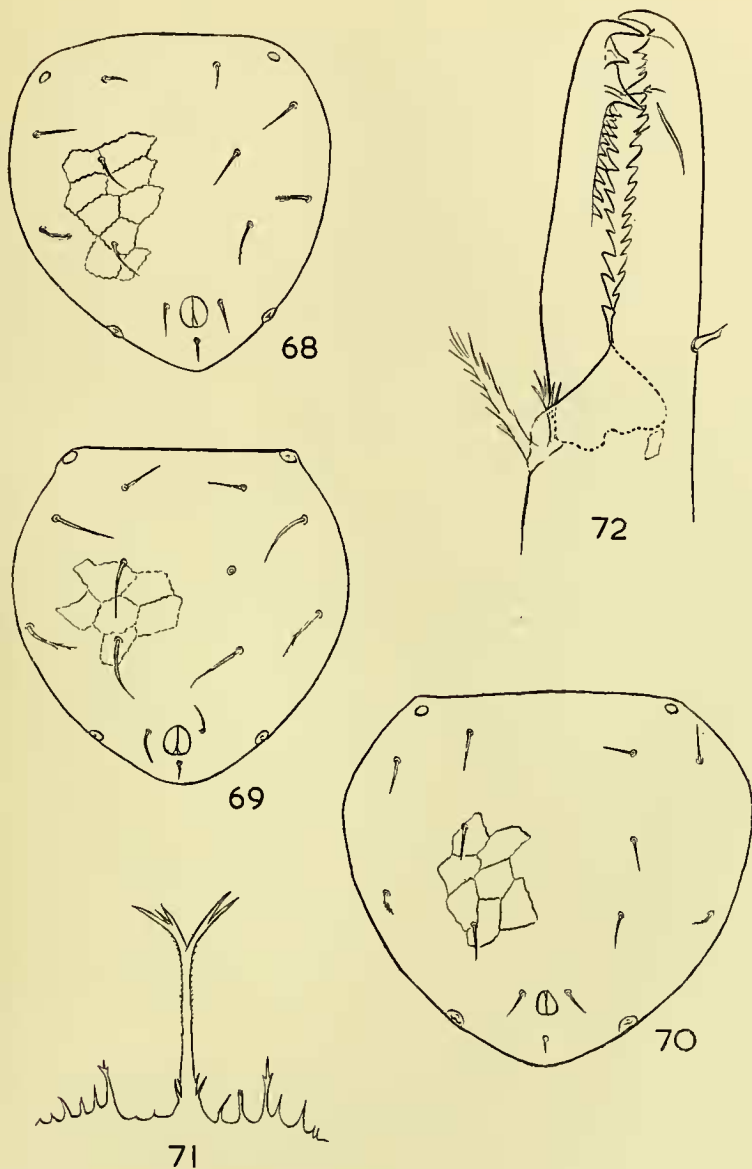
Two species are represented in the British fauna. these may be separated as follows:

1. Dorsal shield with 58 setae; M<sub>1</sub> short and straight (Text-fig. 73). Serrations of the lateral margin of the shield small and rounded (Text-fig. 74). Sternal shield with numerous punctures. Posterior margin of trochanter IV smooth

*Macrholaspis opacus* (C. L. Koch)

- , Dorsal shield with 59 setae; M<sub>1</sub> long and curved distally (Text-fig. 78). Serrations of the lateral margin of the shield considerably longer and tapering (Text-fig. 80). Sternal shield with a network of ridges and punctures. Trochanter IV with a strong tubercle on its posterior margin . . . . . *Macrholaspis dentatus* sp. n.

<sup>1</sup> An additional seta may be present in some species (cf. *Macrholaspis dentatus* sp. n.).



FIGS. 68-72. *Geholaspis (Longicheles) mandibularis* (Berl.), female. Figs. 68-70, variation in the form of the ventro-anal shield. Fig. 71, tectum. Fig. 72, chelicera.

*Macrholaspis opacus* (C. L. Koch)

*Gamasus opacus* Koch, C. L. (1839). *Deutsch. Crust. Myr. Arach.* fasc. 25, t. 24.  
*Macrocheles* (*Nothrholaspis*) *aciculatus* Berlese, A. (1918). *Redia* 13 : 169 syn. nov.  
*Holostaspis terreus*, Halbert, J. N. (1915). *Proc. Roy. Irish Acad.* 31, ii : 66.  
*Macrholaspis opacus*, Oudemans, A. C. (1931). *Ent. Ber.* 8, No. 180 : 272.  
*Nothrholaspis aciculatus*, Willmann, C. (1939). *Ark. Zool.* 31 A, 10 : 6, figs.  
*Macrocheles* (*Nothrholaspis*) *terreus*, Cooreman, J. *Bull. Mus. roy. Hist. nat. Belg.* 19, 63 : 21.

FEMALE. Dorsal shield strongly attenuated posteriorly (Text-fig. 13) and characteristically ornamented in its anterior third with a polygonal network of minute spines (*aciculatus*!). The lateral margins of the shield are distinctly serrated (Text-fig. 74). The vertical setae are strongly developed; setae M<sub>1</sub> are short and plumose (Text-fig. 75). The remaining twenty-seven pairs of plumose setae are distributed as in Text-fig. 73. The extra-marginal setae are of the same form as the marginal series.

The tritosternum is normal with the lacinae pilose. The sternal shield is densely covered with punctures and bears three pairs of simple setae (Pl. 4, fig. 18). The metasternal setae are also simple. The genital shield is covered with punctures which tend to form a network in its anterior two-thirds. Accessory sclerites are well developed and the genital setae are plumose. The ventri-anal shield (approximately 220 $\mu$  long and 198 $\mu$  wide) is oval in outline and, like the dorsal shield, ornamented with spinules. The two pairs of pre-anal setae are plumose, the para-anals long and simple, and the post-anal seta strongly plumose. The interscutal membrane between the genital and ventri-anal is provided with three pairs of platelets, one pair of pore-bearing platelets and a pair of plumose setae. The metapodal shields are conspicuous. The peritreme and peritrematal shield are normal.

The gnathosoma bears four pairs of setae ventrally. The ventral groove has five transverse rows of denticles. The form of the tectum is shown in Text-fig. 76. Both digits of the chelicera are bi-dentate; the distal tooth on the fixed digit is small and difficult to see if the chelicera is not orientated correctly (Text-fig. 77). The *pilus dentilis* is long and stout. The dorsal seta is comb-like.

Leg I (530 $\mu$ ) has plumose setae on the femur, genu and tibia. Tibia I (85 $\mu$ ) is considerably shorter than the tarsus (121 $\mu$ ). Legs II to IV measure 550 $\mu$ , 495 $\mu$  and 800 $\mu$ , respectively.

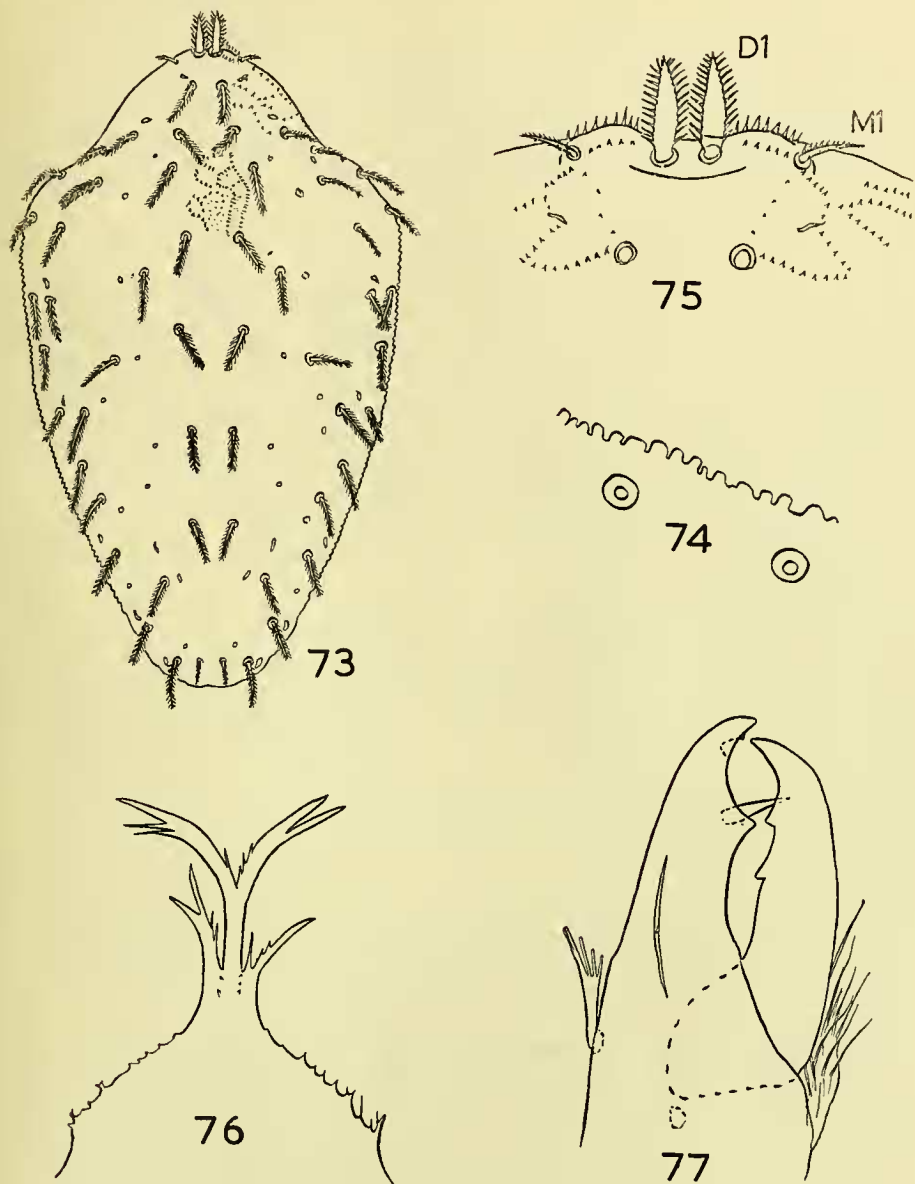
MALE. Unknown.

DIMENSIONS. Female; length 725–740 $\mu$ ; breadth 445–470 $\mu$ .

HABITAT AND LOCALITY. Widely distributed in Europe. Common in decaying wood, moss and litter.

*Macrholaspis dentatus* sp. n.

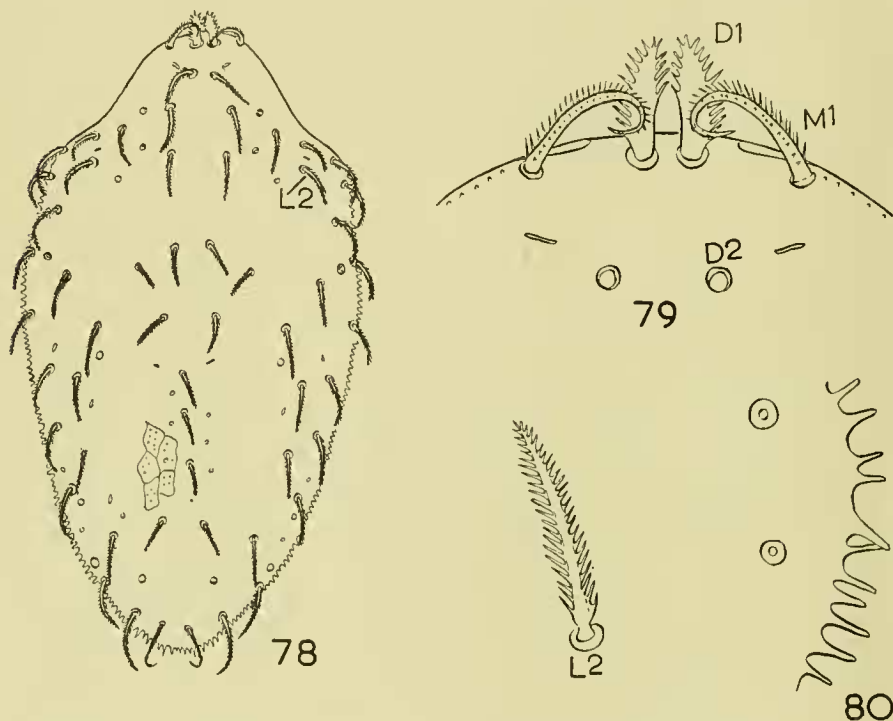
FEMALE. Dorsal shield attenuated posteriorly as in the preceding species but without spinules. The ornamentation consists of a network of lines and punctures (Text-fig. 78). The chaetotaxy of the shield comprises fifty-nine setae arranged as in the figure. The verticals are stout and setae M<sub>1</sub> long, plumose and curved (Text-fig. 79). An interesting feature of the chaetotactic pattern is the presence of three



FIGS. 73-77. *Macrholaspis opacus* (C. L. Koch), female. Fig. 73, dorsal shield. Fig. 74, lateral margin of dorsal shield. Fig. 75, anterior region of dorsal shield. Fig. 76, tectum. Fig. 77, chelicera.

unpaired setae in the dorsal series. The lateral margins of the shield are strongly serrated (Text-fig. 80). The extra-marginal setae are similar to the marginals.

The sternal shield is provided with a network of ridges and punctures and bears three pairs of simple setae (Pl. 4, fig. 19). The metasternal shields are small and free, and the setae simple. The genital shield is strongly ornamented with a network of ridges and punctures; the genital setae are plumose. The ventri-anal shield, similarly



FIGS. 78–80. *Macrholaspis dentatus* sp. nov., female. Fig. 78, dorsal shield. Fig. 79, anterior region of dorsal shield. Fig. 80, lateral margin of dorsal shield.

ornamented, measures  $187\mu$  in length and  $145\mu$  in breadth, and bears two pairs of plumose pre-anal setae. The para-anals are long and simple, and the post-anal seta short and plumose. The interscutal membrane between the genital and ventri-anal shields is provided with platelets and plumose setae as in the preceding species. The peritreme and peritrematal shield are normal.

The chaetotaxy and structure of the gnathosoma are essentially the same as in *opacus*. The form of the tectum and the dentition of the chelicerae are also similar.

Leg I, approximately  $525\mu$  in length, has the tibia considerably shorter than the

tarsus (tibia,  $88\mu$ ; tarsus,  $110\mu$ ). Legs II to IV measure  $575\mu$ ,  $560\mu$  and  $880\mu$  in length, respectively.

**DIMENSIONS.** Length  $765\mu$ ; breadth  $430\mu$ .

**HABITAT AND LOCALITY.** A single female from humus under bracken in the Leri Valley, North Cardiganshire, Wales. Holotype female, 1955.10.22.95.

This species is characterized by the form of setae M1, the ornamentation of the sternal shield and the shape of the ventri-anal shield.

### Genus *HOLOSTASPELLA* Berl.

*Holostaspella* Berlese A. (1904). *Redia* 1: 241

Dorsal shield with twenty-eight pairs of setae. Vertical setae situated on an outgrowth of the dorsal shield. Sternal shield with three pairs of setae; metasternal shields free. Ventri-anal shield with four pairs of pre-anal setae. Gnathosoma normal. Leg I in the female armed with stout spurs. Other characters as in *Macrocheles* Latr.

**TYPE.** *Holostaspis* (*Holostaspella*) *sculpta* Berl., 1904.

This genus is represented in Britain by one species only.

### *Holostaspella ornata* (Berl.)

*Macrocheles vagabundus*, Oudemans, A. C. (1902). *Tijdschr. Ent.* 45: 43, figs.

*Holostaspis ornatus* Berlese, A. (1904). *Redia* 1: 277.

*Holostaspella ornata* Oudemans, A. C. (1931). *Ent. Ber.* 8: 273, syn. nov.

*Holostaspella ornata*, Evans, G. O. (1956). *Proc. Linn. Soc. Lond.*

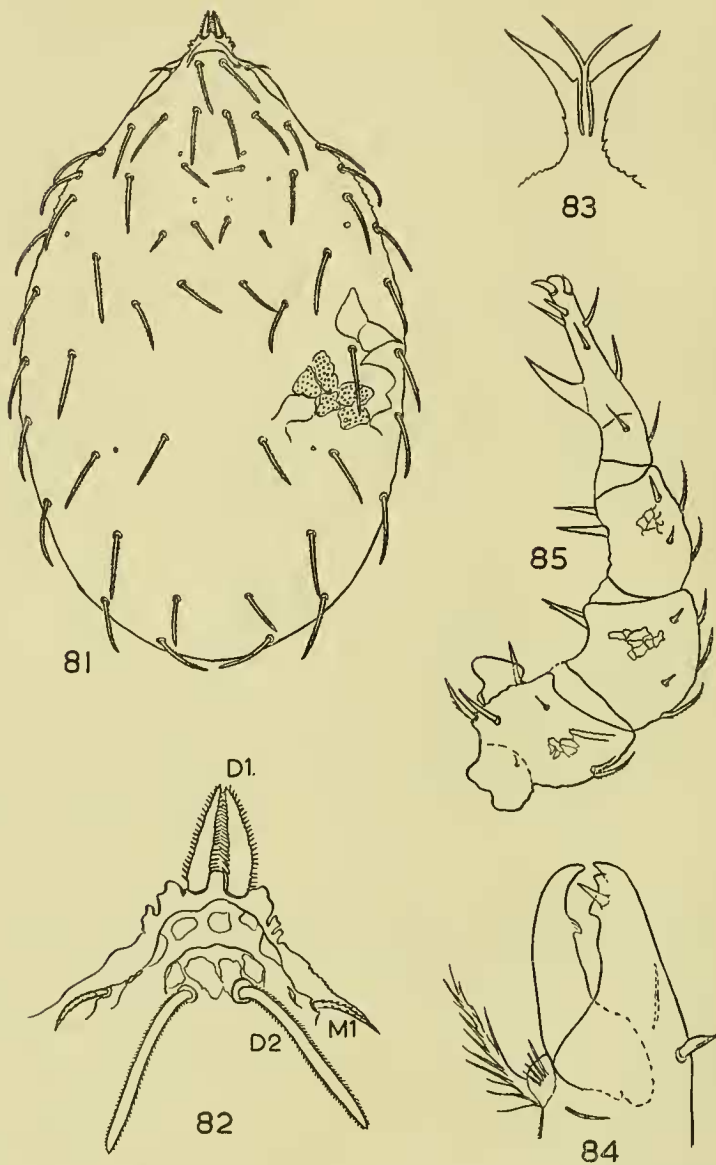
**FEMALE.** Dorsal shield, finely reticulated, bears twenty-eight pairs of setae (Text-fig. 81). The verticals are stout and pilose, and are situated on a prominent projection (Text-fig. 82). The setae on the shield are minutely pilose as shown in the figure.

The sternal shield is massive and characteristically ornamented with ridges and depressions (Pl. 4, fig. 20). The first pair of sternal setae are strongly plumose; the second and third pair smooth. The metasternals, triangular in outline, each bear a simple seta. The large genital shield is richly ornamented; the genital setae simple. Most of the region posterior to coxae IV is occupied by the heavily ornamented ventri-anal shield ( $335 \times 315\mu$ ), which bears four pairs of pre-anal setae in addition to the para-anals and the post-anal seta. The anterior pre-anal is weakly pilose and the post-anal plumose. The interscutal membrane is coarsely striated.

The gnathosoma is normal for the *Macrochelinae*. The lateral processes of the tectum are free (Text-fig. 83). The dentition of the chelicera is shown in Text-fig. 84.

Leg I with the tibia ( $121\mu$ ) shorter than the tarsus ( $132\mu$ ). The femur and trochanter of leg II are spurred; the tarsus has a large stout spine ventrally (Text-fig. 85).

**MALE.** Unknown.



FIGS. 81-85. *Holostaspella ornata* (Berl.), female. Fig. 81, dorsal shield. Fig. 82, anterior region of dorsal shield. Fig. 83, tectum. Fig. 84, chelicera. Fig. 85, leg II (ambulacrum omitted).

DIMENSIONS. Length 924–950 $\mu$ ; breadth 550–560 $\mu$ .

HABITAT AND LOCALITY. This species has previously been recorded from the Netherlands (Oudemans, 1902) and Austria (Franz, 1954). The writers have examined a single specimen taken from *Sphaerocerus* sp. captured at Bagley Wood, Berks (Coll. O. W. Richards, det. Vitzthum). The above description and figures are based on the type from the Oudemans Collection, Leiden.

#### SUMMARY

1. The classification of the *Macrochelidae* is discussed and keys are given for the identification of British species of the *Macrochelinae*.

2. The following three new species are described and figured :

*Macrocheles rothamstedensis* sp. nov.

*Macrocheles punctoscutatus* sp. nov.

*Macrholaspis dentatus* sp. nov.

3. The following species are recorded for the first time from Britain :

*Macrocheles carinatus* (C. L. Koch)

*Macrocheles decoloratus* (C. L. Koch)

*Macrocheles insignitus* (Berl.)

*Macrocheles montanus* (Willmann)

*Macrocheles penicilliger* (Berl.)

*Macrocheles subbadius* (Berl.)

*Macrocheles tardus* (C. L. Koch).

*Geholaspis* (*Longicheles*) *mandibularis* (Berl.)

*Holostaspella ornata* (Berl.)

4. The following species have been relegated to the synonymy :

*Nothrholaspis aciculatus* Berl., 1918 syn. of *Macrholaspis opacus* (C. L. Koch)  
1839.

*Holostaspella ornata* Oudemans, 1931, syn. of *Holostaspella ornata* (Berl.), 1904.

*Macrocheles gladiator* Hull, 1918, syn. (?) of *Macrocheles plumiventris* Hull, 1918.

*Macrocheles plumipes* Hull, 1918, syn. (?) of *Macrocheles plumiventris* Hull, 1918.

*Macrocheles minimus* Hull, 1918, syn. of *G. (Longicheles) mandibularis* (Berl.),  
1904.

*Macrocheles hulli* Falconer, 1923, syn. of *Macrocheles carinatus* (C. L. Koch),  
1839.

*Macrocheles occidentalis* Hull, 1925, syn. of *Macrocheles submotus* Falconer,  
1924.

*Macrocheles gloriosus* Hull, 1925, syn. of *Macrocheles submotus* Falconer, 1924.

*Nothrholaspis fimicola* Sellnick, 1932, syn. of *Macrocheles plumiventris* Hull,  
1925.

*Coprholaspis anglicus* Turk, 1946, syn. of *Macrocheles glaber* (Müller), 1860.

## ACKNOWLEDGMENTS

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